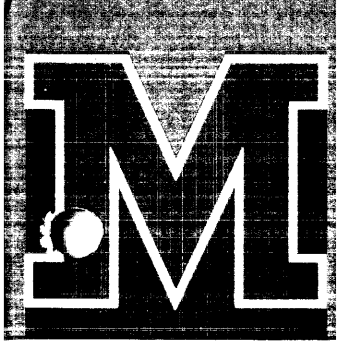

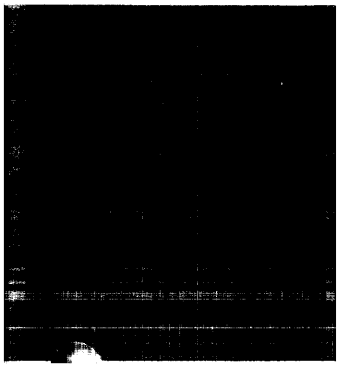

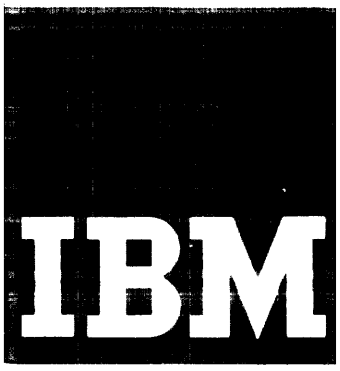

Reference Manual

519 Document-Originating Machine

IBM Reference Manual

519 Document-Originating Machine

This Reference Manual, Form A24-1017-0,
obsoletes the Manual of Operation, Form 224-3292-7,
and all previous editions. Major changes are:

PAGE	SUBJECT
18	Testing the PX Function in Gangpunching Operation
40	Count-Controlled Punching and Serial-Number Printing Device
25	End Printing
33	Reset and Restoring Procedures
47	Timing Chart

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Contents

IBM 519 Document-Originating Machine

IBM 519 Document-Originating Machine

The IBM 519 Document-Originating Machine permits the rapid, automatic preparation of IBM card documents. Reproducing, gangpunching, and end printing are the basic functions of the machine.

This Reference Manual illustrates these functions with control-panel diagrams and notes. Several operations can be performed simultaneously on the 519 and these combinations are discussed in detail.

Special devices and features are included in a separate section. These devices are also fully illustrated with control-panel diagrams.

A control-panel summary and timing chart are provided to facilitate control-panel wiring and machine operation.

Reproducing is the operation of sensing any or all of the punched holes in one set of cards and punching them into another set of cards.

Gangpunching is the punching of information from a master card into each of the detail cards that follow it.

End printing enables the printing of up to eight digits on the face of the card during a single run through the machine. Another eight digits can be printed on a subsequent run. These digits can be printed on the face of the card in which they are punched (interpreting). It is also possible to print numbers on one set of cards from the punched holes in another set of cards (transcribing).

Features can be incorporated in the machine to perform these additional functions:

Comparing. Both gangpunched and reproduced information can be checked for agreement between the source and the resulting punched holes. This feature is incorporated in the machine, if specified, for either 45 or 80 columns.

Summary Punching. The totals accumulated in an accounting machine can be punched into summary cards if the 519 is equipped for summary punching.

Double-Punch & Blank-Column Detection. Card columns can be checked for multiple punches or for blanks if this special device is installed.

Mark Sensing. Information recorded in the form of pencil marks on IBM cards can be automatically translated into punched holes in those cards when this special device is installed. When mark sensing is specified, double-punch and blank-column detection is furnished at no charge so that mark-sensed punching can be checked.

The 519 performs all operations at the rate of 100 cards per minute. Because of interlocking with the accounting machine, 1.2 seconds are required to punch a single summary card when the machine is used as a summary punch.

The IBM 519 is available in five models:

1. With summary punching and 80 columns of comparing
2. With summary punching and 45 columns of comparing
3. With 80 columns of comparing
4. With 45 columns of comparing
5. With reproducing only.

Components and Features

Control Panel

The IBM 519 operates with a control panel (Figure 1) that is wired to direct the machine to perform various operations when varying conditions occur. The panel is divided into two sections. The machine controls are found at the left side of the left-hand panel. The rest of the panel is used for position wiring – for example, to direct the machine to read columns 11-20 and punch into columns 21-30.

The control panel contains 44 columns of hubs numbered 1-44, and 28 rows of hubs lettered A-BB. The location of any hub can be identified by the use of these co-ordinates.

There are two types of hubs on the control panel: exits and entries. An exit hub emits an impulse, and an entry hub accepts an impulse wired to it. A connection must always be made *from* an exit *to* an entry, and the exits and entries used depend entirely upon the job the machine is called upon to do. The hubs that normally emit impulses are identified by red stripes on the control panel, and by shaded stripes on the control-panel diagrams.

In Figure 1, some sections of the control-panel diagram are shaded. These sections indicate special devices and possible additional capacity for various features. The hubs that are not shaded indicate the features in a full-capacity (Model 1) standard machine.

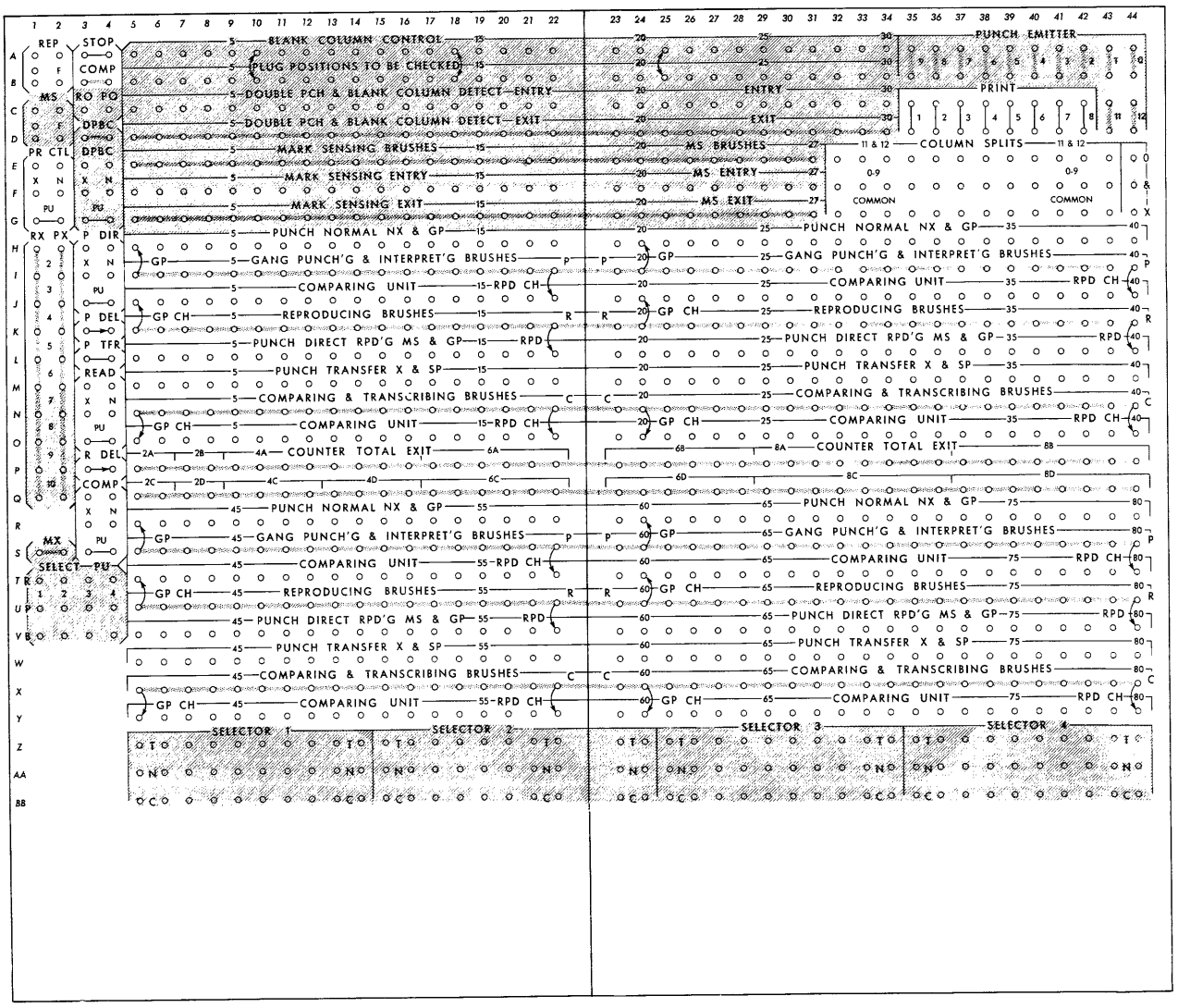


Figure 1. Control Panel

Operating Keys, Switches, and Signals

Operating keys and signal lights are shown in Figure 2.

MAIN-LINE SWITCH

The main-line switch, located on the right end of the machine, must be turned on to supply power to the machine.

START KEY

If cards have been placed in the feed hoppers, pressing the START key causes the machine to start feeding cards. The START key must also be pressed to resume operation if, for any reason, card feeding has stopped.

STOP KEY

When the STOP key is pressed, card feeding stops at the end of the cycle.

RESET KEY

If card feeding has stopped as a result of certain error conditions, the RESET key must be pressed before operation can be resumed. The specific error conditions are explained later in the manual.

READY LIGHT (UNLABELED)

The unlabeled red light at the left comes on when the main-line switch is turned on, to indicate that the machine is ready for operation. The light is off while cards are fed into the machine.

COMPARING LIGHT

If the machine has stopped as a result of a comparing error, the COMP light, as well as the light in the comparing indicator unit, comes on. These lights go off when the unit is reset.

DPBC DETECTION LIGHT

If the machine has stopped as a result of a double-punch or blank-column error, the DP & BC DETECT light comes on. The light goes off when the RESET key is pressed.

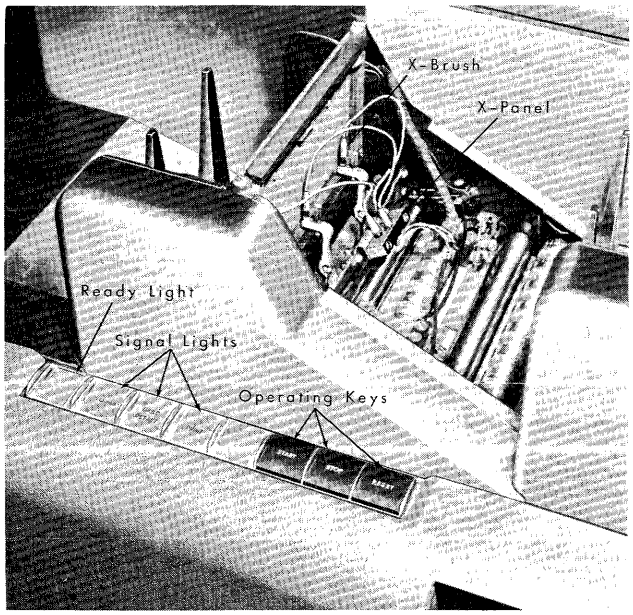


Figure 2. Operating Keys and Signal Lights

PRINT LIGHT

The PRINT light comes on when the print unit is engaged and ready to print. When the print unit is not being used, it should be disengaged to minimize wear on the unit and the ribbon. The light goes off when the unit is disengaged.

CARD FEED UNITS

A schematic diagram of the two card feed units (Read Unit and Punch Unit) is shown in Figure 3. Normally cards are placed in the feed hoppers face down, 12-edge toward the throat of the machine. Each feed hopper holds about 800 cards, and each stacker holds about 1000 cards. Card feeding stops automatically:

1. if either hopper becomes empty
2. if either stacker is filled
3. if a card fails to feed.

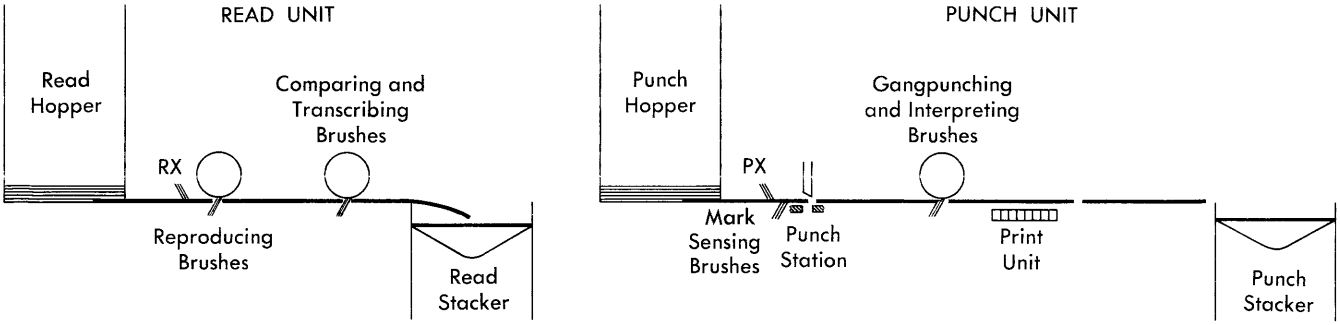


Figure 3. Schematic of the Card-Feed Units

Read Unit

Cards fed through the read unit, from the hopper to the stacker, pass a set of RX control brushes and two sets of reading brushes – the reproducing brushes and the comparing-transcribing brushes.

RX Brushes

Six RX (Read X) brushes are standard. They can be set to read X-punches in any six columns of the card; however, at least two columns must intervene between any two brush settings. The RX brushes read the X-position of the card column before the card reaches the reproducing brushes. As a card passes the reproducing brushes, the operation of the machine can be controlled by the presence or absence of X-punches in specific columns.

When the RX brushes have been located in the desired columns, they must be wired to the small X-panel in the read feed (Figure 3). The hubs on this panel are connected to the correspondingly numbered hubs on the control panel.

Reproducing Brushes

The 80 reproducing brushes read the entire card as it passes this brush station. This reading can be used either to reproduce information into a card passing the punch station, or to compare cards previously gangpunched in the punch unit.

Comparing and Transcribing Brushes

After a card has passed the reproducing brushes, it passes the comparing and transcribing brushes. These 80 brushes read the entire card. This reading is normally used to compare cards reproduced on the preceding cycle or previously gangpunched. It can also be wired to end print up to 8 digits on a card passing the gangpunching brushes on the same cycle. This operation is called *transcribing*. Feeding past this station is mechanically controlled by the punch unit.

Punch Unit

Cards fed through the punch unit pass a set of PX control brushes, a punch station, a set of gangpunching and interpreting brushes, and a print unit.

PX Brushes

Cards placed in the punch hopper are read first by the PX (Punch X) brushes as they enter the machine. Six PX brushes are standard. These can be set to read an X-punch in any column of the card; however, at least two columns must intervene between any two brush settings. The PX brushes read the X-position of a card before the card reaches the punch station. The operation of the machine as a card passes the punch station can be controlled by the presence or absence of X-punches in specific columns.

When the PX brushes have been located in the proper columns, they must be wired to the small X-panel inside the punch feed. The hubs on this panel connect with the correspondingly numbered hubs on the control panel.

Punch Station

Eighty punches allow punching in any position of a card as it passes the punch station.

Gangpunching and Interpreting Brushes

After a card has passed the punch station, it passes the gangpunching and interpreting brushes. In a reproducing operation, the 80 brushes read the entire card for comparing with a source card that is passing the comparing and transcribing brushes. If the machine is being used for gangpunching, information is wired back to the punch station to punch into the following card. Information can also be wired from this reading station to the print entry hubs, to cause up to eight digits to be printed on the face of the card. This operation is called *interpreting*. If the machine is equipped with the double-punch and blank-column detection device, data are wired to the device from this station when this type of checking is desired.

Print Unit

As a card passes the gangpunching and interpreting brushes, information read from the card can be used to set up the eight print wheels in the print unit. After the card has passed the gangpunching brushes, it passes the print unit and the information set up in the wheels is printed on the face of the card.

Data from cards in the read feed can be transcribed to cards in the punch feed. The comparing and transcribing brushes are used for this operation.

The print wheels contain the numbers 0-9 and a blank position. Blank columns and columns not wired are not printed. Punched zeros to the left of the first significant digit are not printed. Zeros wired to print to the right of a significant digit cannot be suppressed.

COMPARING FEATURE

A comparing unit is used to compare punching in two cards for verification purposes. The two cards can be in the read unit, or one card can be in the read unit and one in the punch unit. When the compared information differs, the machine stops, and the COMP (Comparing error) light on the key panel and the light in the comparing indicator unit come on. Comparing indicators (Figure 4) point out the positions in which the cards failed to compare. Comparing is a selective feature, supplied for 45 or 80 columns as specified.

On standard machines, the comparing indicator unit is restored by lifting the lever at the left of the indicators. When certain special devices are installed, the comparing unit can be restored automatically through control-panel wiring. On these machines the RESET key is used to restore the comparing unit if a manual reset is necessary.

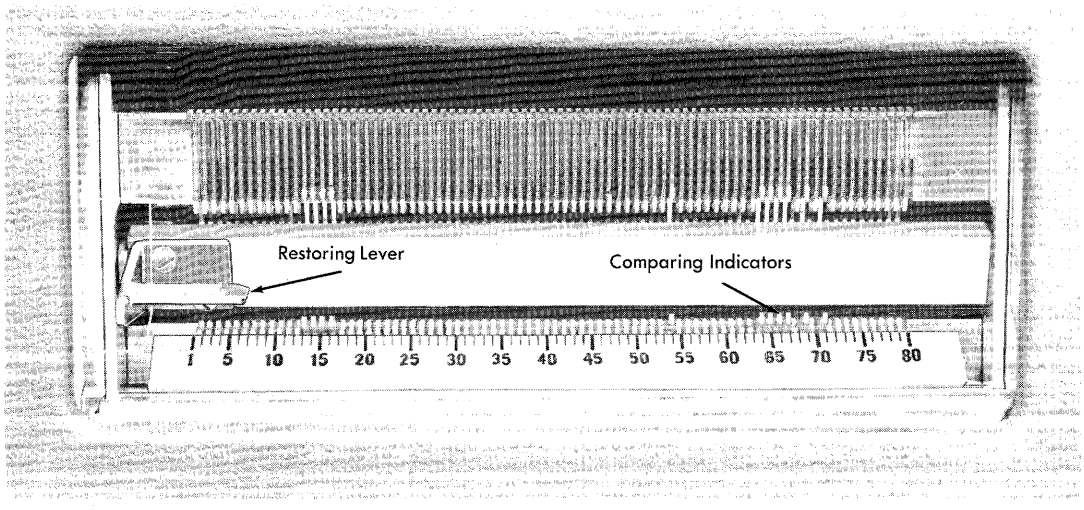


Figure 4. Comparing Indicator Unit

Typical Operations

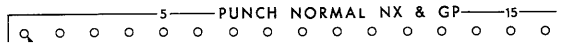
Gangpunching

In gangpunching operations, information that is common to a group of cards is read from a master setup card and punched into the detail cards that follow it through the punch unit. When the master card passes the gangpunching brushes, the first detail card is passing the punch station. The master card is read by the gangpunching brushes, and this information is transmitted to the punch magnets to punch the first detail card. On the next card cycle, the first detail card passes the gangpunching brushes, and the information from the first detail card punches in the next detail card. Each card passing through the machine serves in its turn as the setup card to punch the card directly behind it.

Gangpunching from a single master card can be accomplished by wiring from the GANGPUNCHING BRUSHES to either of two sets of entries to the punch magnets — PUNCH NORMAL or PUNCH DIRECT. The accuracy of the gangpunching is checked by visually comparing the master card and the last detail card each time the punch stacker is emptied.

I, S, 5-44

Gangpunching and Interpreting Brushes. These 80 hubs are the control-panel exits for the corresponding columns of the card as it passes the gangpunching and interpreting brushes.



H, R, 5-44

Punch Normal NX & GP. These 80 hubs are normally entries to the punch magnets for punching the corresponding columns of the card. Impulses wired to these hubs cause punching unless punching is suspended by the punch-direct switch or punch transfer is impulsed.

L, V, 5-44

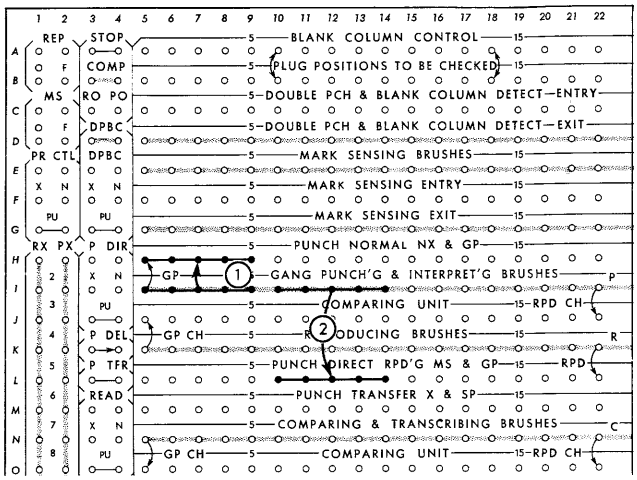


Figure 5. Gangpunching

Punch Direct RPD'G MS & GP. These 80 hubs are direct entries to the punch magnets for punching the corresponding columns of the card. Impulses wired to these hubs cause punching unless punching is suspended by the punch-direct switch.

WIRING (FIGURE 5)

1. Columns 1-5 are gangpunched by wiring from the GANGPUNCHING BRUSHES to the PUNCH NORMAL entries.
2. Columns 6-10 are gangpunched by wiring from the GANGPUNCHING BRUSHES to the PUNCH DIRECT entries.

Interspersed Master-Card Gangpunching

This operation differs from single master-card gangpunching because several master cards are interspersed with the detail cards. Whenever a new master card passes the punch station, punching is prevented. Then when the new master card passes the gangpunching brushes, punching is restarted with the new data.

Because each new master card passes the punch station while the previous detail card passes the gangpunching brushes, the master card must be recognized so punching can be suspended during this cycle.

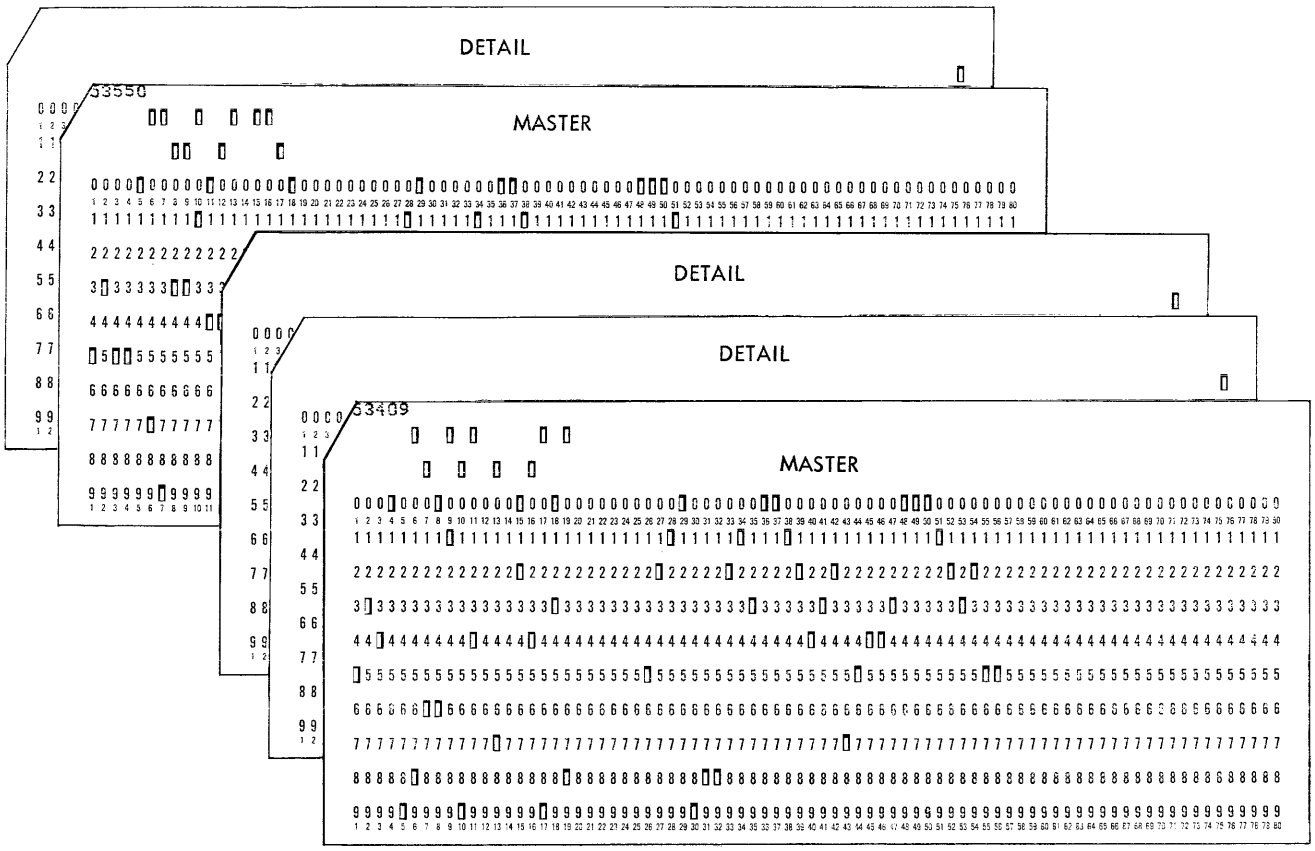


Figure 6. Interspersed Master Cards

Master and detail cards can be distinguished by X-punching one type of card; i.e., each master card may contain an identifying X-punch in a column in which the detail cards are never X-punched, or each detail card may contain an X in a column in which the master cards are never X-punched. In Figure 6, all the detail cards are identified by an X-punch in column 80. The X-detail system has the advantage that the chance of erroneously punching into the master card is minimized. The identifying X-punch is read by a PX brush before the card reaches the punch station. The PX brush must be placed in the column containing the X.

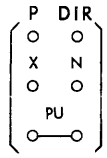
Either of two features of the machine can be used to prevent gangpunching each master card with data from the last detail card of the preceding group. They are the punch-direct feature and the punch-transfer feature.

Punch-Direct Method

When the punch-direct method of interspersed master-card gangpunch control is used, all punching is suspended whenever a master card passes the punch station. To identify the master card, the PX reading is wired, on the control panel, to the pickup of the punch-direct feature.

H-Q, 2

PX (Punch X Brushes). These hubs are the control-panel exits for the PX brushes, which are located slightly before the punch station. A PX brush must be located in the column in which the identifying X appears. Six PX brushes are standard. PX brushes cannot be set in adjoining columns; at least two columns must intervene between any two brush settings. The PX brushes read the X-punches just before the punching of the card begins.



H-J, 3-4

P Dir (Punch Direct). This switch can be wired to control all punch inlets, to permit punching for only one type of card, X or NX.

The PU (Pickup) hubs are normally wired from the PX brush that is set to read the identifying X in the card. Then, if the X hubs are jackplugged, only X-cards are punched; if the N hubs are jackplugged, only NX-cards are punched. If the pickup hubs are wired and neither the X nor N hubs are jackplugged, NX-cards are punched; if the pickup hubs are not wired and the X hubs are jackplugged, no punching occurs.

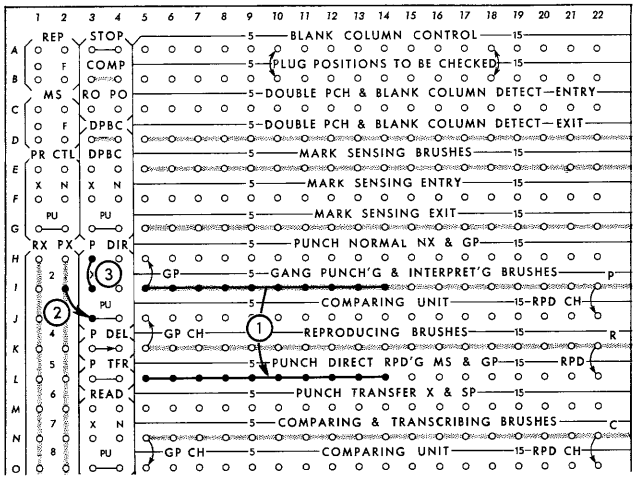


Figure 7. Interspersed Master-Card Gangpunching Punch-Direct Method

WIRING (FIGURE 7)

1. Impulses from the holes read at the gangpunching and interpreting brushes are wired to the PUNCH DIRECT entries. (The PUNCH NORMAL entries are also receptive.)
2. PX brush 2 is placed to read the X in each detail card. PUNCH DIRECT PICKUP is impulsed from the PX brush for each X-detail card.
3. Because the X-detail cards are to be punched, P DIR X is jackplugged. To control this operation for X-master cards, remove the jackplug from the P DIR X switch and either wire P DIR N or leave both X and N unwired.

NOTE: The gangpunch field cannot be wired to end print or to the special DPBC feature when this method of control for interspersed master-card gangpunching is used.

GANGPUNCH COMPARING

To verify interspersed master-card gangpunching, the read unit is used in an operation similar to gangpunching. The gangpunched cards are placed in the read hopper. Comparing can begin as soon as a group of cards has been punched and while more cards are being gangpunched in the punch unit.

In the read unit, the reproducing brushes have the same relative position as the punch station in the punch unit, and the comparing brushes correspond to the gangpunching brushes. By wiring these two sets of read brushes to corresponding positions of the comparing unit, a comparison can be made between the holes in the master card and the holes that were punched in the following detail card. The principle of control-panel wiring is similar to that used for gangpunching. When a new master card is at the reproducing brushes, comparing must be suspended for one cycle to prevent comparison of the new master card with the last detail card of the preceding group. When the master card is read by the comparing brushes, the first detail card (at the reproducing brushes) is compared with the master card. On the following cycle, the second detail card is compared with the first, etc.

H-Q, 1

RX (Read X Brushes). These hubs are the control-panel exits for the RX brushes, which are located slightly before the reproducing brushes. An RX brush must be located in the column in which the identifying X appears. Six RX brushes are standard. RX brushes cannot be set in adjoining columns; at least two columns must intervene between any two brush settings.

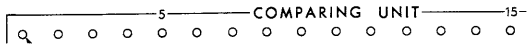
The RX brushes read the X-punches just before the card passes the reproducing brushes.

K, U, 5-44

Reproducing Brushes. These 80 hubs are exits for the corresponding columns of the cards passing the reproducing brushes.

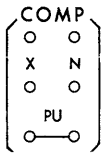
N, X, 5-44

Comparing and Transcribing Brushes. These 80 hubs are exits for the corresponding columns of the card passing the comparing and transcribing brushes.



J, O, T, Y, 5-44

Comparing Unit. Two entries are provided for each position of the comparing unit. Whenever an impulse enters one of these entries, it should be matched by a similar impulse to the corresponding entry. The impulses are compared by the unit; if they do not agree, card feeding stops, the comparing error light and the light in the comparing unit come on, and an impulse is emitted at the STOP hub (A, 3-4). Simultaneously, the indicators in the comparing unit (Figure 4) show which comparing positions failed to agree.



Q-S, 3-4

Comp (Comparing). This switch can be wired to make comparing effective for only one type of card, X or NX.

The PU (Pickup) hubs are normally wired from the RX brush that is set to read the identifying X in the card. Then, if the X hubs are jackplugged, cards are compared only when an X-card is at the reproducing brushes; if the N hubs are jackplugged, cards are compared only when an NX-card is at the reproducing brushes. If the pickup hubs are wired and neither the X nor N hubs are jackplugged, cards are compared only when an NX-card is at the reproducing brushes. If the pickup hubs are not wired and the X hubs are jackplugged, no comparing occurs.

WIRING (FIGURE 8)

1. The REPRODUCING BRUSHES and the COMPARING AND TRANSCRIBING BRUSHES for the gangpunched columns (Figure 7) are wired to the entries to the comparing unit.
2. RX brush 2 is placed to read the X in each detail card. The RX brush reading is wired to the COMPARING PICKUP.
3. Because the detail cards are to be compared, COMP X is wired.

NOTES: This operation can be controlled for X-master cards by removing the wire from the COMPARING X switch (item 3) and either wiring COMP N or leaving both X and N unwired.

This wiring may be placed in the control panel with the wiring of Figure 7. Both operations can take place at the same time.

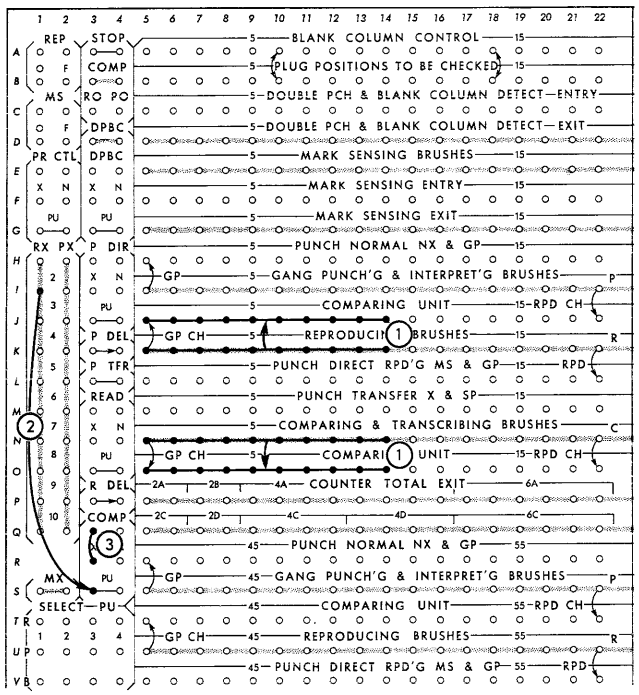


Figure 8. Interspersed Master-Card Gangpunch Comparing

PUNCH-TRANSFER METHOD

When the punch-transfer method of interspersed master-card gangpunch control is used, punching the gangpunch field in the master cards is prevented by an internal selector system. This selector is represented on the control panel by 80 TRANSFER and 80 NORMAL entries to the punch magnets, and a pickup (P TFR). To identify the master cards, the PX reading is wired to the pickup. If the detail cards are X-punched, the gangpunch field is wired to the PUNCH TRANSFER entries; if the master cards are X-punched, the gangpunch field is wired to the PUNCH NORMAL entries.

Because punching the gangpunch field in the master cards is prevented by selection rather than by the suspension of all punching, other fields can be punched in the master card, if desired.

This method of interspersed master-card gangpunch control must be used whenever a field that is punched is also wired to some other entry, such as print or DPBC detection. If the punch direct method of X-NX control is used, incorrect punching and printing can occur.

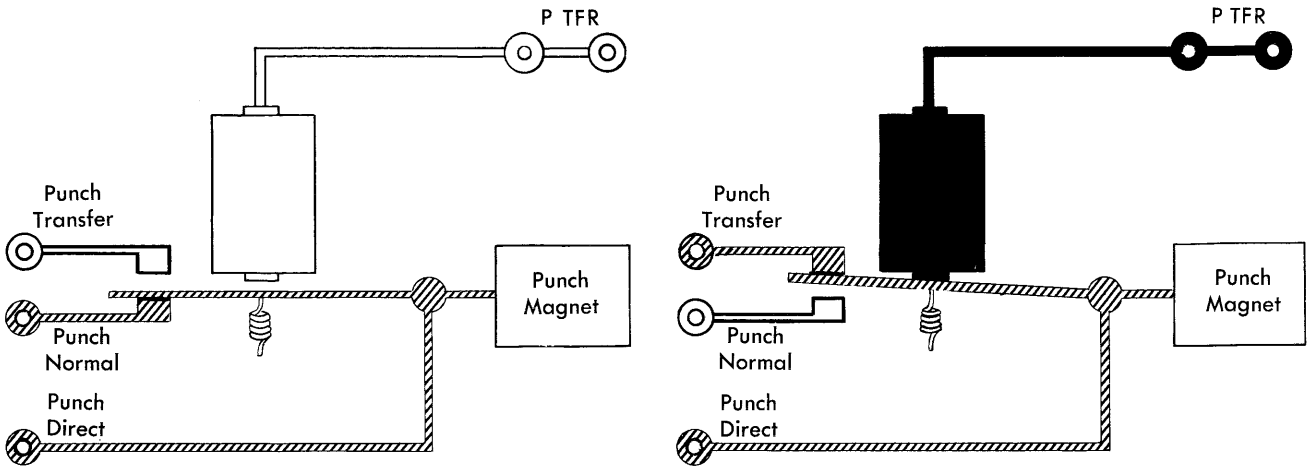
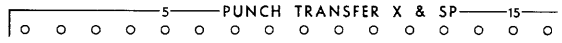


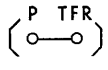
Figure 9. Operation of the Punch Transfer Feature

The control-panel diagram (Figure 10) shows the necessary wiring when columns that are wired to punch must also be wired to another entry. In this diagram, the columns being gangpunched are also being interpreted on the card.



M, W, 5-44

Punch Transfer X & SP. These 80 entry hubs are connected to the punch magnets through an 80-position internal selector. One position of this unit is shown in Figure 9. Normally the punch magnets are connected through the selector to the PUNCH NORMAL entries. If P TFR is impulsed, however, the selector transfers, disconnecting the PUNCH NORMAL entries and connecting the PUNCH TRANSFER entries to the punch magnets. The PUNCH TRANSFER entries are not connected until the P TFR pickup hub is impulsed.



L, 3-4

P Tfr (Punch Transfer). These pickup hubs control the 80-position internal selector that permits either the PUNCH NORMAL entries or the PUNCH TRANSFER entries to be connected to the punch magnets. When P TFR is impulsed, PUNCH TRANSFER becomes the entry to the punch magnets, and PUNCH NORMAL is disconnected. Otherwise, PUNCH NORMAL is effective, and PUNCH TRANSFER is disconnected.

WIRING (FIGURE 10)

1. The GANGPUNCHING AND INTERPRETING BRUSHES are wired to both PUNCH TRANSFER entry and PRINT entry.
2. PX brush 2 is wired to P TFR. This makes the PUNCH TRANSFER hubs entries for punching the X-detail cards.

The other wiring is the same as for the previous diagram (Figure 8).

NOTE: To change this wiring for X-master operation, the GANGPUNCHING BRUSHES must be wired to PUNCH NORMAL instead of PUNCH TRANSFER.

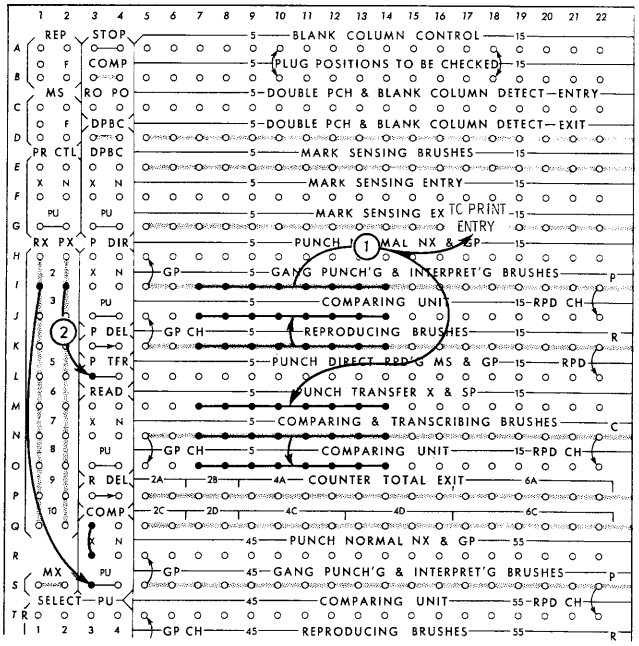


Figure 10. Interspersed Master-Card Gangpunching and Comparing — Punch Transfer Method

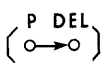
Offset Gangpunching

Whenever data from certain columns in the master cards are gangpunched into different columns in the detail cards, the operation is known as *offset gangpunching*. For example, the information in columns 50-54 of the master cards can be punched into columns 3-7 of the detail cards. Whenever a master card passes the gangpunching brushes, columns 50-54 of the master card must be punched into columns 3-7 of the detail card that follows. Whenever a detail card passes the gangpunching brushes, columns 3-7 must be read and punched into columns 3-7 of the following card if that card is a detail card. When a master card follows a detail card, punching must be suspended as in normal gangpunching, to prevent punching the master card.

Because this operation requires that information be read from either of two card fields, selection is required. The PUNCH NORMAL and PUNCH TRANSFER entries to the punch magnets are used for this selection and are controlled by the identifying X-punch in the cards. The X can be punched in either the master cards or the detail cards.

The X-reading that picks up punch transfer must be delayed one cycle because cards are not read until they reach the gangpunching brushes. At that time the PUNCH TRANSFER entries must be active if an X-card is being read for gangpunching into the following card, or the PUNCH NORMAL entries must be active if an NX-card is being read.

If the X-detail system is used, the PUNCH TRANSFER hubs are receptive as each X-detail card passes the gangpunching brushes; therefore, normal gangpunching from the detail-card field is wired from the GANGPUNCHING BRUSHES to PUNCH TRANSFER. The PUNCH NORMAL entries are receptive as an NX-master card passes the gangpunching brushes; so, the master field is wired to PUNCH NORMAL. In an X-master operation, the wiring would be reversed; i.e., the master field is wired to PUNCH TRANSFER and the detail field to PUNCH NORMAL.



K, 3-4

P Del (Punch Delay). When the left hub is impulsed from a PX brush, the impulse is remembered and is available at the right hub one cycle later, just before the X-card passes the gangpunching brushes. In effect, this may be thought of as a reading from an imaginary PX brush located just before the gangpunching brushes.

WIRING (FIGURE 11)

1. PX brush 2 is wired to the PUNCH DIRECT PICKUP to suspend punching as the master card passes the punch station. Because the X-cards are detail cards, the PUNCH DIRECT X hubs are jackplugged.
2. PX brush 2 is also wired to PUNCH DELAY. Just before each detail card passes the gangpunching brushes, the delay exit (right hub) emits an impulse that picks up punch transfer.
3. The PUNCH NORMAL entries are receptive when a master card passes the gangpunching brushes; therefore, GANGPUNCHING BRUSHES 50-54 are wired to PUNCH NORMAL entries 3-7 for master-to-detail gangpunching.
4. Normal gangpunching from detail-to-detail is wired from GANGPUNCHING BRUSHES 3-7 to PUNCH TRANSFER entries 3-7.

NOTE: If master cards are X-punched and detail cards are not, the wiring shown in Figure 11 is altered by removing the jackplug from the PUNCH DIRECT X hubs and reversing the wiring to the punch entries.

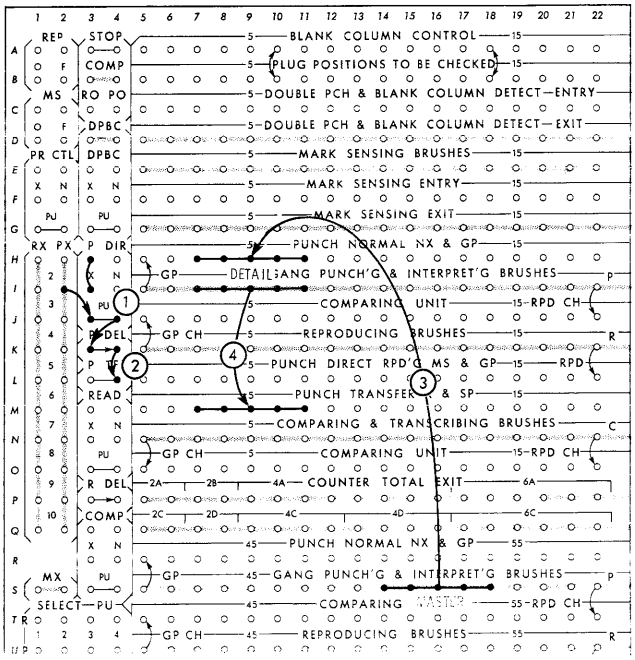


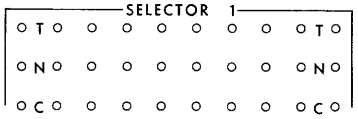
Figure 11. Offset Gangpunching — X-Detail Operation

COMPARING

When offset gangpunching is compared, field selection similar to that required when the cards were punched is necessary. The selection must be made to read the proper field from the card at the comparing brushes. When a master card is at the comparing brushes, the master field must be read for comparison with the detail card at the reproducing brushes; when a detail card is at the comparing brushes, the detail field must

be read for comparison with the following detail card at the reproducing brushes. The detail field is always read at the reproducing brushes, and comparison is suspended when a master card is at the reproducing brushes. The detail field from the reproducing brushes is entered in one side of the comparing unit, and the master or detail field from the comparing brushes is entered in the other side of the comparing unit.

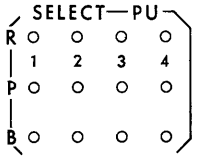
Selecting the fields read at the comparing brushes requires the use of a selector on the control panel. The selector is controlled by the identifying X in the cards. As in the punch unit, the X-reading must be delayed one cycle. At that time the X-card is at the comparing brushes and the selector must be controlled.



Z-BB, 5-44

Selectors. Selectors can be installed in the machine as a special feature. Each selector has ten positions, and each position has a C (Common), N (Normal), and T (Transferred) hub. The operation of the C, N, and T hubs depends upon whether or not a selector pickup hub is impulsed. Figure 12 shows the general operation of a selector. When a pickup hub is not impulsed, the selector is normal, as in the left diagram, and a connection is made between the common and the normal hub for each position of the selector. When the selector pickup hub is impulsed, as in the right diagram, the selector transfers and a connection is made between the common hub and the transferred hub. The normal hub is disconnected when the transferred hub is connected, or vice versa.

The selectors have three pickup hubs. In general, only one pickup hub should be used for a selector for any given operation.



T-V, 1-4

Select PU (Selector Pickup): R. The R (Read) pickup hub is normally wired from an RX brush to cause the selector to transfer and remain transferred until the X-card passes the reproducing brushes.

P. The P (Punch) pickup hub is receptive to PX brush readings. Selectors picked up in this manner are held in the transferred condition until the X-card passes the punch station.

B. The B (Balance) pickup hub is receptive to a balance-test impulse from the accounting machine for non-net-balance summary-punching operations. The balance-pickup impulse is obtained on the 519 control panel from the extreme left position of a COUNTER TOTAL EXIT.

R and P pickups can be used interchangeably when both feeds are being used. B pickup can only be used when summary punching.

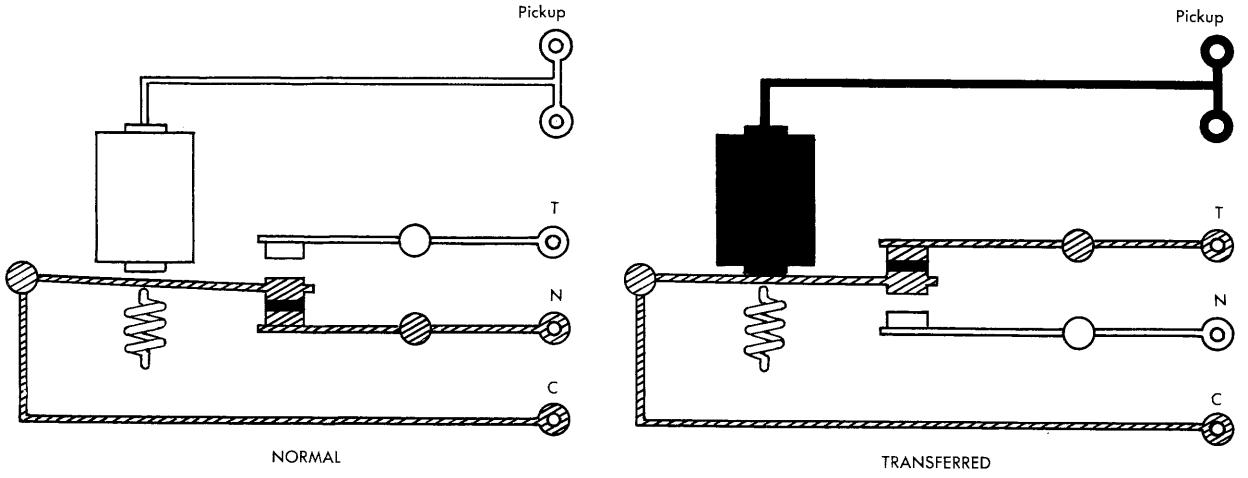


Figure 12. Operation of a Selector

P, 3-4

R Del (Read Delay). When the left hub is impulsed from an RX brush reading, the impulse is remembered and is available from the right hub at RX time of the following cycle. In effect, this may be thought of as a reading from an imaginary X-brush located just before the comparing and transcribing brushes.

WIRING (FIGURE 13)

1. RX brush 2 is wired to the COMPARING PICKUP. Because X-detail cards are to be compared, the COMPARING X hubs are jackplugged.
2. RX brush 2 is also wired to the READ DELAY entry. When an X-card passes the comparing brushes, the exit hub emits and transfers selector 1.
3. The detail field (columns 3-7) is wired from the COMPARING BRUSHES through the transferred side of the selector to the COMPARING ENTRIES. The offset field from the NX-master cards (columns 50-54) is wired from the COMPARING BRUSHES through the normal side of the selector to the COMPARING ENTRIES.
4. Comparing is effective only when X-detail cards are passing the reproducing brushes; so, the other side of the comparing unit is wired from the REPRODUCING BRUSHES directly from the detail field (columns 3-7).

NOTE: For X-master operation, the wires to the normal side of the selector must be interchanged with those in the transferred side, and the jackplug must be removed from the COMPARING X hubs.

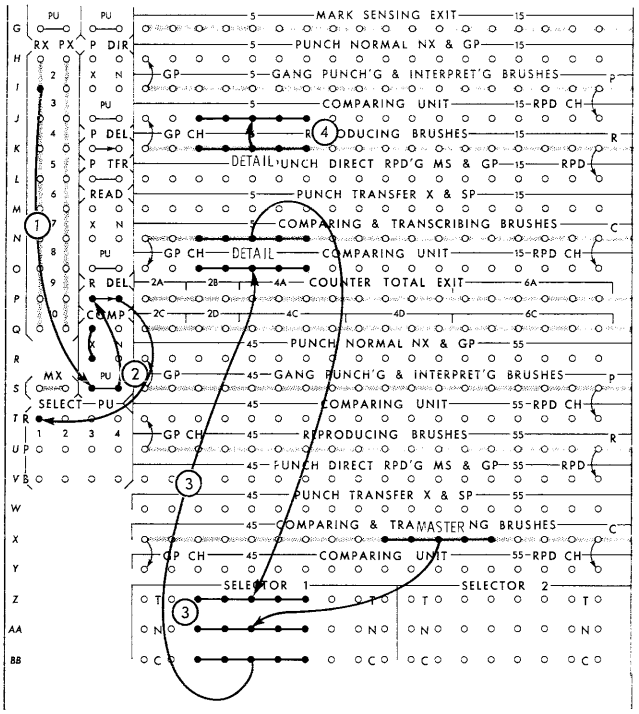


Figure 13. Offset Gangpunch Comparing -- X-Detail Operation

Major-Minor Gangpunching

Certain gangpunched information may remain constant for a major card group while other gangpunched information changes for minor groups. This application reduces many keypunching operations.

In a labor distribution application, weekly job reports for each man are punched with department number, man number and variable information (Figure 14). Department number is keypunched only in the first card for each department; man number is keypunched only in the first card for each employee. Major-minor gangpunching is used to complete the punching of department number and man number in succeeding detail cards.

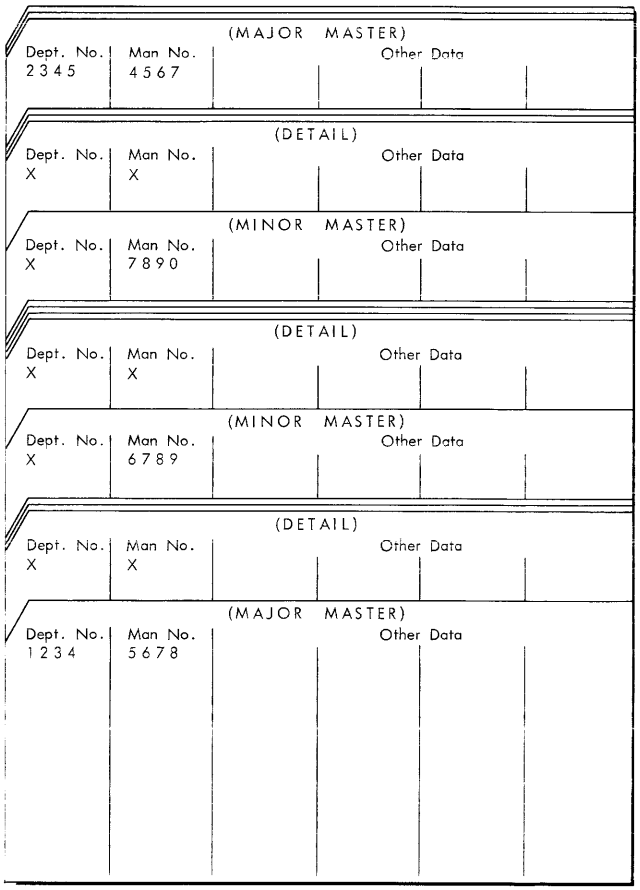


Figure 14. Cards for Major-Minor Gangpunching

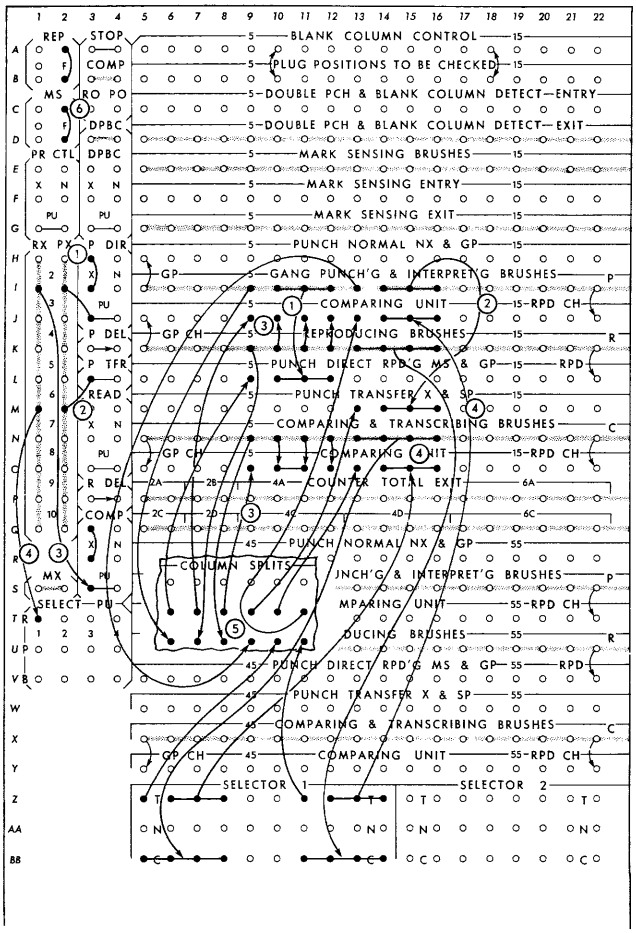


Figure 15. Major-Minor Gangpunching

Because the first card for each department and for each man serves as a master, the first card of each group and sub-group must be distinguished from the detail cards that follow. When the cards are keypunched, the fields of the detail cards are X-skipped and hence contain an X-punch. Therefore, the NX-major card is a major-master card; an NX-minor card is a minor-master card; and a card with neither X serves as both a major and minor master card. Department number is gangpunched into all cards of the major group (including the minor-masters). Man number is gangpunched into only the cards for that man. The control-panel diagram (Figure 15) illustrates the wiring. The wiring used to gangpunch and gangpunch verify the major information is the same as that used for any interspersed master-card gangpunching.

1. Major gangpunching (Cols. 5-8) is wired to PUNCH DIRECT. Punch Direct is picked up by wiring from PX2 for punching X-5 cards.
2. Minor gangpunching (Cols. 9-12) is wired to PUNCH TRANSFER. Punch Transfer is picked up by wiring from PX6 for punching X-9 cards.
3. Major gangpunching is verified normally under control of COMP PU, picked up by wiring from RX2 for comparing X-5 cards.
4. Minor gangpunching is verified through a class selector picked up by wiring from RX6 for comparing X-9 cards.
5. Column splits prevent gangpunching of the punched skip X's, and also prevent comparing the column 5-X and 9-X positions that are not punched alike in the master and detail cards.
6. The reproducing switch is wired OFF; the mark-sensing switch is wired OFF.

Testing the PX Function in Gangpunching Operations

In gangpunching operations with interspersed master cards, punching is suspended when master cards pass the punching station. This is accomplished by wiring a PX brush to the Punch Direct pickup hub. Obviously, if a PX brush is not properly set or is wired erroneously on the control panel, punching is not suspended for master cards, thus causing what is commonly termed *lace punching*. Normally, the erroneous punching is not detected until the cards are verified later through the reading unit.

A method of immediately detecting lace punching is illustrated in Figure 16. The COMP PICKUP hub is wired from the PUNCH DELAY hub. The X-punch in the master card is wired to the comparing unit. If the PX feature functions correctly, comparing is suspended as the master card passes the punch brushes, and the operation continues without interruption. If the PX feature fails, comparing is not suspended, and the X-impulse from the master card causes the machine to stop. Cards may be removed from the hopper and those in the machine run out. If the control panel is removed before the cards in the machine are run out, one master card and only one detail card behind it need to be made over. Gangpunch comparing in the read feed is *not* possible during this operation.

Px brush 5 is set on column 65. If the PX feature fails, the machine stops.

Wiring (Figure 16)

1. Px brush 5 impulses PUNCH DIRECT to suspend punching when master cards pass the punching station.
2. PUNCH DELAY to COMP PU suspends comparing one cycle later.
3. X in column 65 of the master card is wired through a column split to a comparing position.

NOTE: This wiring is for master gangpunching operations. For X-detail operations, the X-switch in the Punch Direct and Comparing units must be wired.

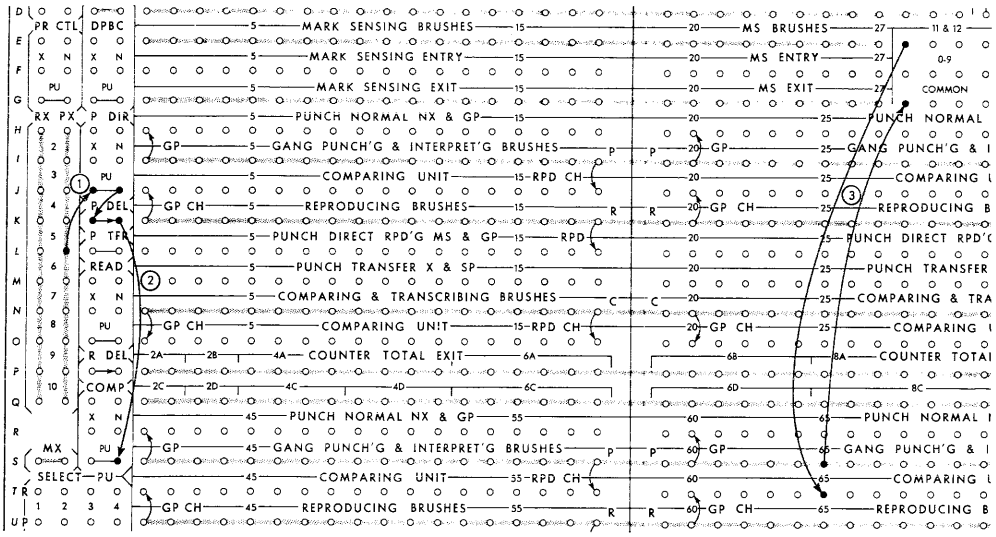


Figure 16. Testing the PX Function in Gangpunching

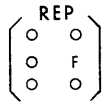
Reproducing

To reproduce a part or all of the data in a file of cards, the two units are operated together. The original source cards are placed in the read unit, and the cards to be punched are placed in the punch unit. Data are read from the source card at the reproducing brushes and punched, digit-by-digit, into the card passing the punch station.

Comparison of the reproduced information can be done one cycle later on the same run of the cards through the machine. When the source card is passing the comparing brushes, the reproduced card is passing the gangpunching brushes. At that time, the reproduced card is compared with the source card, using the comparing unit, and any disagreement stops the machine. When the machine is started again, the second card to enter the punch stacker and the first card to enter the read stacker do not agree.

When a comparing error occurs, the machine stops. When the machine is performing a reproducing operation, it is possible to run the cards out of the machine without resetting the comparing unit. The cards are removed from both hoppers, and the START key is held down until all the cards have reached the stackers. No further punching or comparing occurs on this runout; the last card punched is not compared automatically and must be compared visually with the source card. After the error cards have been checked visually with the comparing indicators to determine the columns in error, the unit is reset manually by lifting the restoring lever at the left of the comparing indicators. When the unit has been reset, the cards are replaced in the hoppers and the START key is pressed to resume operation. The last card run out to the read stacker has not been reproduced because punching was suspended on the run out. It should precede the cards placed in the read hopper.

An alternate method is sometimes used when only one or two columns are in error. The operator notes the columns in error, resets the comparing unit, and operates the machine for two cycles. When the cards are removed from the stackers, the top card in the punch stacker and the next-to-top card in the read stacker do not agree. With this method, it is not necessary to run the cards out and in again.



A-B, 1-2

REP (Reproduce Switch). This switch must be wired ON to cause the read and punch units to operate together; at all other times, the switch should be wired OFF, or not wired. When the switch is wired ON, if either unit runs out of cards or fails to feed a card, the machine stops.

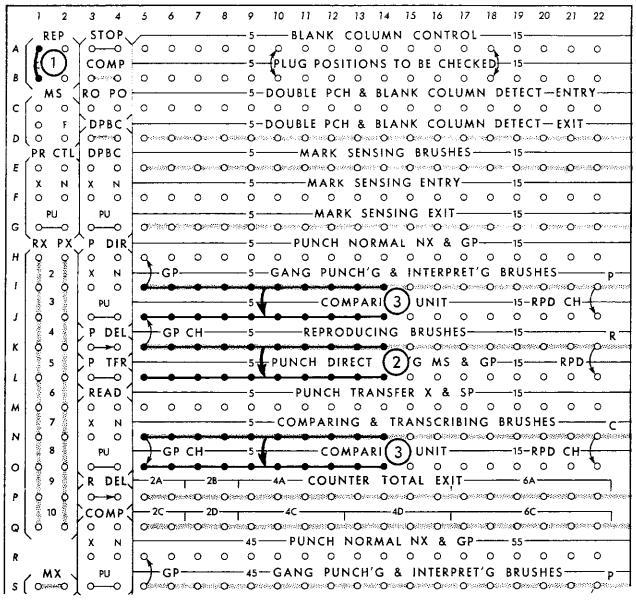


Figure 17. Reproducing and Comparing

WIRING (FIGURE 17)

1. Because the units are being used together, REP is wired ON.
2. Information from the card passing the reproducing brushes reaches the punch unit through the PUNCH DIRECT entries.
3. The reproduced holes are compared with a second reading of the holes in the source card. The GANG-PUNCHING BRUSHES and the COMPARING BRUSHES are wired into the opposite sides of the comparing unit, in corresponding positions.

Field-Selected Reproducing

To select information from one of two fields in the source card and reproduce it into a single field of the reproduced card, the punch normal and punch transfer entries are used. Selection is made by the presence or absence of an X-punch in a specified column that is read by an RX brush. The field to be reproduced from the X-cards is wired to the punch transfer entries and the field from the NX-cards is wired to the punch normal entries.

When the reproduced information is compared, the X and NX fields in the source cards must again be selected. The X-reading is delayed one cycle and a selector is transferred for each X-card when it is read by the comparing brushes; the selector is normal when each NX-card is read by the comparing brushes.

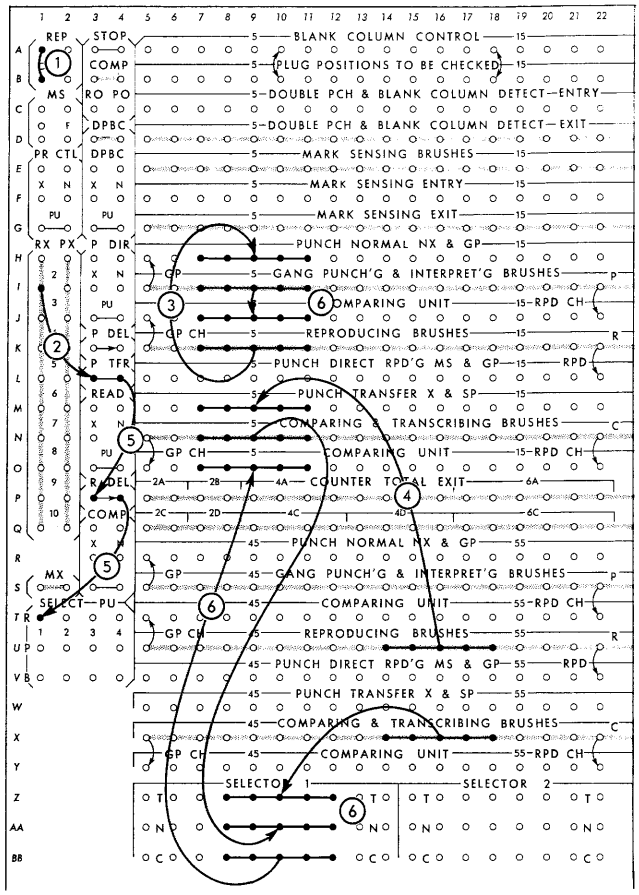


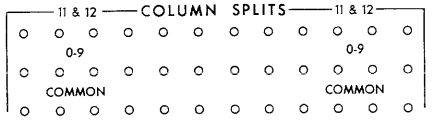
Figure 18. Field-Selected Reproducing and Comparing

WIRING (FIGURE 18)

1. REP is wired ON, because the units are to operate together.
2. RX brush 2, which reads the control column, is wired to P TFR.
3. When an NX-card passes the reproducing brushes, columns 3-7 are reproduced through the PUNCH NORMAL entries.
4. When an X-card passes the reproducing brushes, columns 50-54 are reproduced into columns 3-7 through the PUNCH TRANSFER entries.
5. The RX brush reading is also wired to the READ DELAY entry. Just before the X-card passes the comparing brushes, the delay exit emits a delayed RX impulse that picks up selector 1.
6. When the selector is transferred, columns 50-54 of the X-source card at the comparing brushes are compared with columns 3-7 of the card passing the gangpunching brushes. Otherwise, the selector is normal, and columns 3-7 of the NX-source card are compared with columns 3-7 of the card passing the gangpunching brushes.

X-Elimination or Transfer

Frequently it is desirable to eliminate or transfer the control X-punches that have been punched over numerical fields. This requires a column split.

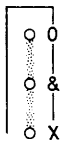


E-G, 32-43

Column Splits. The column-split feature is a 12-position selector that is internally controlled to transfer between the X and 0 positions of the card. Each COLUMN SPLIT has a COMMON, a 0-9, and an 11-12 hub. The column split is controlled so that a connection exists between the COMMON hub and the 11-12 hub while the 12 and 11 positions of the card are being read. This connection is broken, and a connection is made between the COMMON and the 0-9 hub while the 0-9 card positions are being read.

When a brush is wired to the COMMON hub of a column split, the 0-9 punches read by that brush can be taken from the 0-9 hub to a punch entry position. The X- or 12-punches read by the same brush are available at the 11-12 hub, from which they can be wired to a different punch entry position or, if elimination is desired, left unwired. Similarly a column split can be used to separate the X- and 0-impulses that are available from the 0 & X hubs.

Column splits are also used to combine an X or 12 punch with a 0-9 punch from two sources, to punch in a single column.



E-G, 44

0 & X. Three common hubs emit both 0- and X-impulses on each card cycle. To isolate an X- or 0-impulse a COLUMN SPLIT must be used. These impulses can be used to punch control X-punches or to increase the size of a field by punching fill-in zeros.

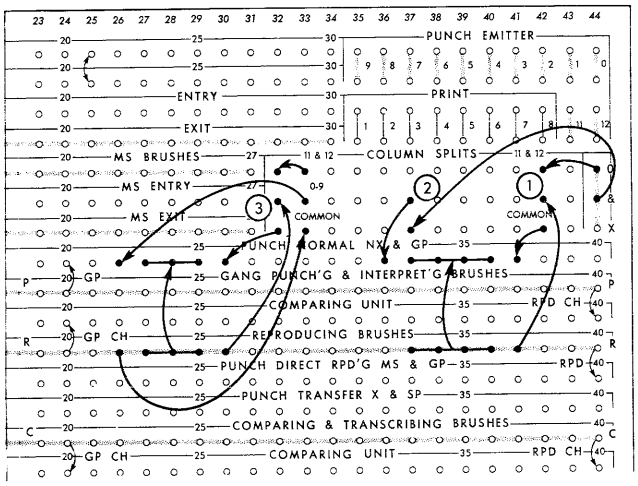


Figure 19. X-Elimination and Transfer

WIRING (FIGURE 19)

1. This wiring punches an X over a field being reproduced.
2. This wiring punches a zero in the high-order position, to increase the size of a field.
3. This wiring transfers an X-punch from the high-order position to the units position of a field. (It could be transferred to any other column equally as well.) The reproducing brush reading the high-order column is wired to the COMMON of the second COLUMN SPLIT. The X in this column is combined, in the first COLUMN SPLIT, with the digit to be punched in the units column. The 0-9 punching in the high-order column is available from the 0-9 hub of the second COLUMN SPLIT and is punched in the high-order column.

Selective Reproducing

It is often desirable to reproduce only certain cards from a file, without disturbing the order of the cards. The cards to be reproduced (or those not to be reproduced) are identified by an X-punch. The operation is like normal reproducing except that punching is suppressed for unwanted cards. A card is fed in the punch unit for each card in the read unit. During the operation, X-source cards and/or their corresponding reproduced (or blank) cards can be offset in the stackers, if an offset-stacking device is installed. When manual selection of offset cards is not practical, separation can be made on a sorter.

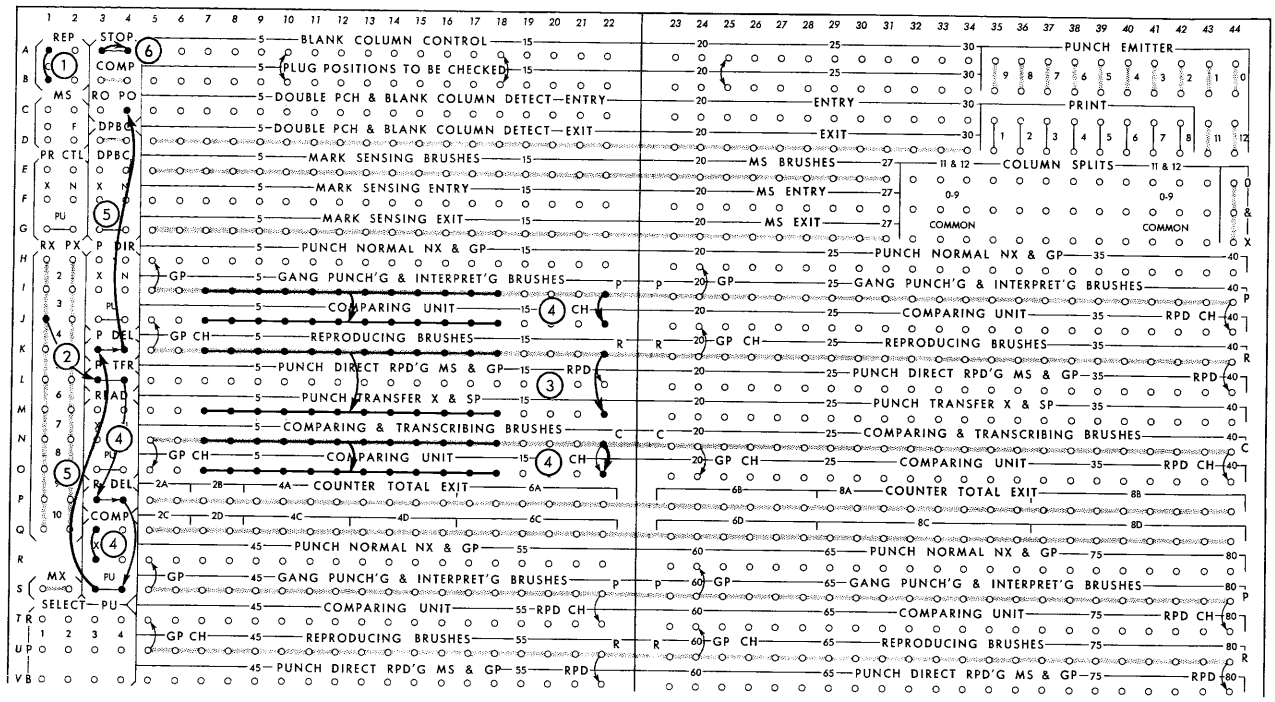
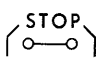


Figure 20. Selective Reproducing and Comparing

In Figure 20, X-18 cards only are to be reproduced; RX brush 3 is set to read column 18.

C, 3-4

RO (Read Offset), PO (Punch Offset). These hubs are entries for the special offset-stacking devices for the read and punch feeds. When the RO hubs are impulsed, the card at the comparing brushes is offset 3/8 inch forward when it reaches the stacker; when the PO hubs are impulsed, the card at the gangpunching brushes is offset 3/8 inch forward when it reaches the stacker. (See *Offset Devices* under *Special Devices*).



A, 3-4

Stop. On the standard machine these hubs are common and part of the circuit to stop the machine on a comparing error. These common hubs emit an impulse as soon as an unequal comparison occurs. To permit restarting the machine, the restoring lever on the comparing unit (Figure 4) must be lifted (if a comparing error) and the RESET key must be pressed.

On a machine equipped with both RO and PO stacking devices, these STOP hubs are not common: the left hub is then an exit and the right is an entry.

The left hub emits an impulse when a comparing error occurs. This impulse can be jackplugged to the right hub to stop the machine – in which case the comparing unit is restored by pressing the RESET key. Or, this impulse can be wired to RO and/or PO to offset the cards in the stackers – in which case the comparing unit is restored automatically.

The right hub accepts a DPBC impulse to stop card feeding at the end of the cycle. To permit restarting the machine, the RESET key must be pressed.

WIRING (FIGURE 19)

1. Because the units are being used together, REP is wired ON.
2. When an X-18 card reaches the RX brushes, P TFR is impulsed. This makes the PUNCH TRANSFER entries receptive as the source card passes the reproducing brushes.
3. Reproducing takes place through this wiring.
4. The reproduced cards are compared on the following cycle. The comparing control is wired through the read delay unit to be effective as the X-source card passes the comparing brushes. The COMPARING X switch is jackplugged.

5. Punch offset is wired to offset selectively reproduced cards. This allows for easy manual separation of the selectively reproduced cards from the blank cards. To offset the proper card the RX impulse is delayed for two cycles by wiring through read delay and punch delay.
6. When the machine is equipped with both offset stackers, the STOP switch must be jackplugged as shown to stop card feeding when an error is detected.

Combined Reproducing and Gangpunching

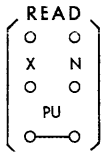
For all combined reproducing and gangpunching operations, the read and punch units operate together. If gangpunching is to be performed from a single master card and no master-card control is used, a blank card should precede the cards in the read unit. This is necessary because the master gangpunch card in the punch unit should be one card cycle in advance of the first source card in the read unit, to avoid reproducing the first source card into the gangpunch master card. The reproduced data can be compared in this same operation.

If reproducing is done in combination with interspersed master-card gangpunching, the master cards may be interspersed with the cards to be punched, or they may be interspersed with the source cards.

GANGPUNCH MASTERS INTERSPERSED IN THE PUNCH UNIT

With the gangpunch masters interspersed in the punch unit, whenever a new master card arrives at the punch station, punching must be suspended for one cycle so that the master card can be passed and not punched. At the same time, feeding in the read unit must be stopped, so that the next source card can be reproduced into the card following the gangpunch master.

In Figure 21, the gangpunch masters are X-punched.



M-O, 3-4

Read. This switch can be wired to control feeding in the read unit, so that feeding is permitted for only one type of card (X or NX) in the *punch* unit.

The PU (Pickup) hubs are normally wired from the PX brush that is set to read the identifying X. Then, if the X hubs are jackplugged, a card is fed past the reproducing brushes whenever an X-card is fed past the punch station; if the N hubs are jackplugged, a card is fed past the reproducing brushes whenever an NX-card is fed past the punch station. If the pickup is wired and neither the X- nor N-hubs are jackplugged, the operation is the same as when the N hubs are jackplugged.

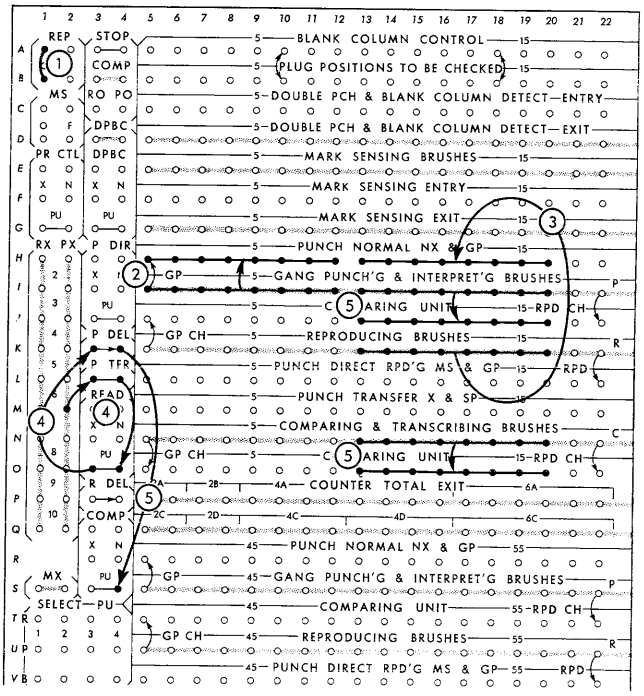


Figure 21. Reproducing and Gangpunching Masters in Punch Unit

WIRING (FIGURE 21)

1. Because the two units are operated together, REP is jackplugged.
2. Gangpunching takes place through this wiring.
3. Reproducing takes place through this wiring.
4. When an X-master card is read by PX brush 6, P TFR is impulsed to suspend all punching. The READ control pickup is impulsed (and neither the X nor N hubs are jackplugged) to suspend feeding of the next card in the read unit. The PX impulse is also wired to the punch delay unit so that the impulse is available for control when the master card passes the gangpunching brushes.
5. The reproduced information is compared by wiring to the comparing unit from the COMPARING BRUSHES and the GANGPUNCHING BRUSHES.

On any cycle that feeding is suspended, the cards ahead that have already passed the reproducing brushes are fed, so that comparing can occur on that cycle. This switch does not affect feeding in the punch unit.

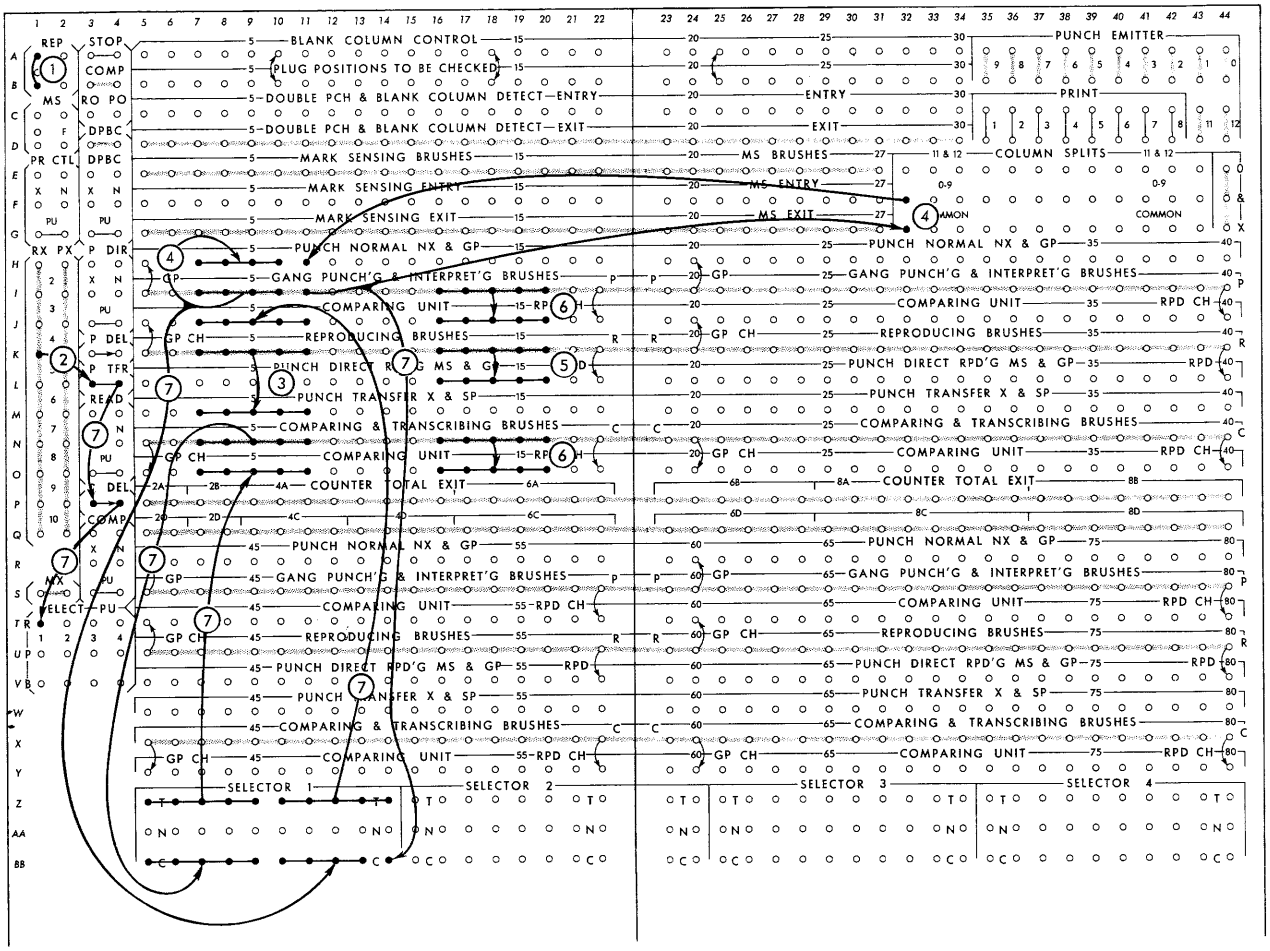


Figure 22. Reproducing and Gangpunching — Masters in Read Unit

After the new master card passes the punch station, feeding is resumed in the read unit. Because no card passes the comparing brushes when the master card passes the gangpunching brushes, comparing must be suspended to prevent the machine from signalling an error when the master card is read. Cards are compared only when an NX-card is read, by wiring from PUNCH DELAY to COMPARING PICKUP.

GANGPUNCH MASTERS INTERSPERSED IN THE READ UNIT

With the gangpunch masters interspersed in the read unit, whenever a new master card passes the reproducing brushes, it is reproduced into the card passing the punch station. This card becomes the setup card for gangpunching into the next group of detail cards. The reproduction of the master card is compared in this operation, and the gangpunching is verified in a later operation. For gangpunch verification purposes, the master X must be reproduced.

In Figure 21 the gangpunch masters are X-punched in column 7.

WIRING (FIGURE 22)

1. Because the two units are used together, REP is jackplugged.
2. The X-7 master cards in the read unit are sensed by RX brush 4. This is wired to pick up punch transfer.
3. When PUNCH TRANSFER is receptive, the gangpunch master information is reproduced from the master card by wiring from REPRODUCING BRUSHES to PUNCH TRANSFER.
4. For detail cards, the PUNCH NORMAL hubs are receptive; so, gangpunching is wired from the GANGPUNCHING BRUSHES to PUNCH NORMAL. Column 7 is wired through a COLUMN SPLIT to prevent gangpunching the master X in the detail cards.
5. Other information can be reproduced during either of these cycles (master or detail); therefore, the field is wired to the PUNCH DIRECT entries.

6. Reproduced fields are compared in the normal manner.
7. The gangpunch master information is compared on the cycle after it is reproduced, through the use of a selector. The selector is transferred, through the read-delay unit, as the master source card passes the comparing brushes and the reproduced master card passes the gangpunching brushes.

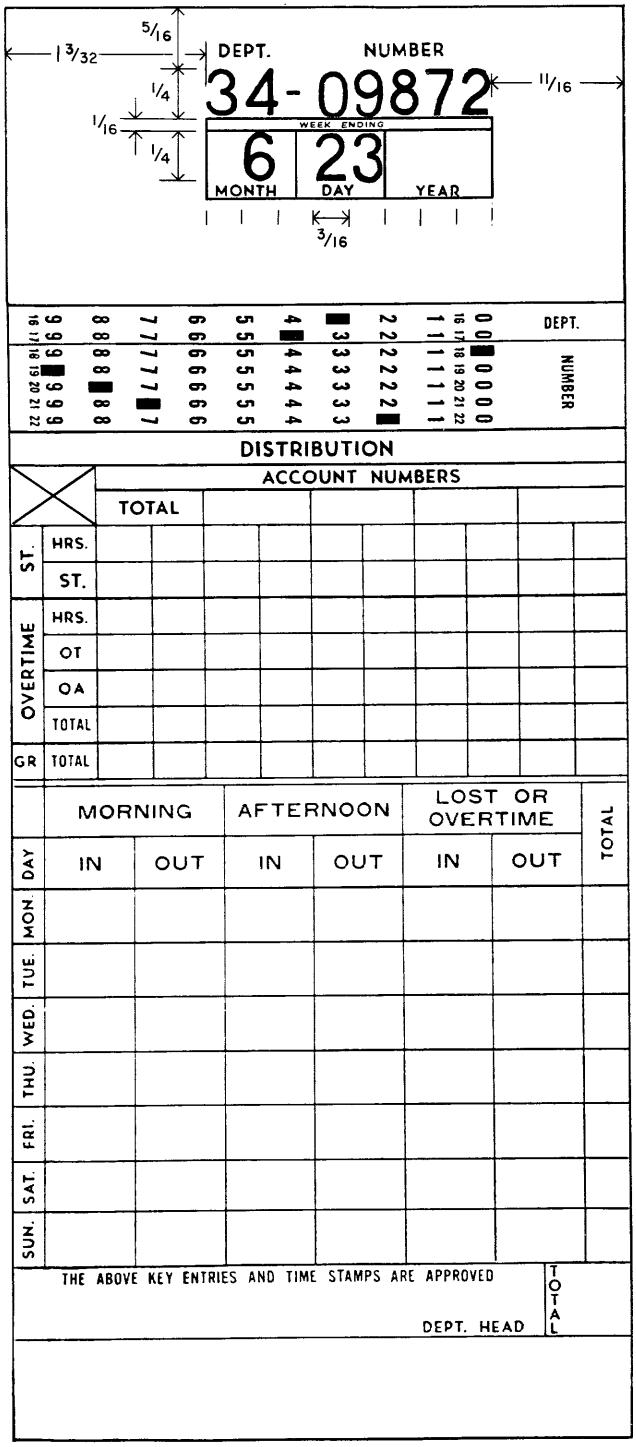


Figure 23. End Printing

End Printing

The print unit consists of eight print wheels, each of which contains the digits 0-9 and a blank position. The unit is used for printing as many as eight digits in a line on the face of the column-1 end of a card fed through the punch unit.

The information can be read from the card itself (interpreting), or it can be read from an emitter or from a card in the read unit at the comparing brushes (transcribing).

Information can be printed on either of two lines of the card (Figure 23). The top of the first line is 5/16 inch from the end of the card, and the top of the second line is 5/8 inch from the end of the card. Printing on two lines requires two runs of the cards through the machine. The printing line is selected by latching the printing unit in one of three notches in the rail on which the unit slides (Figure 24). The middle notch causes printing on the first line; the notch farthest from the operator causes printing on the second line; the notch nearest the operator disengages the unit. The print unit should be disengaged when not in use, to prevent unnecessary wear on the moving parts.

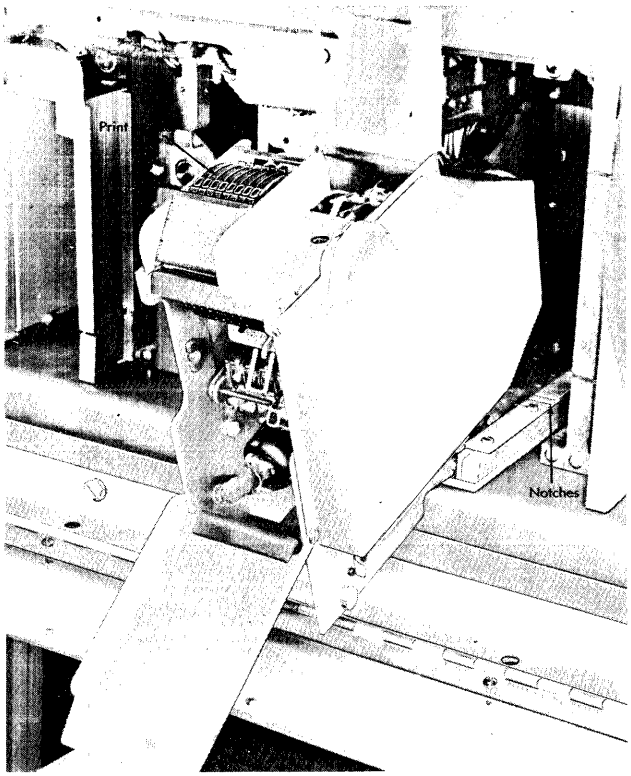


Figure 24. Print Unit

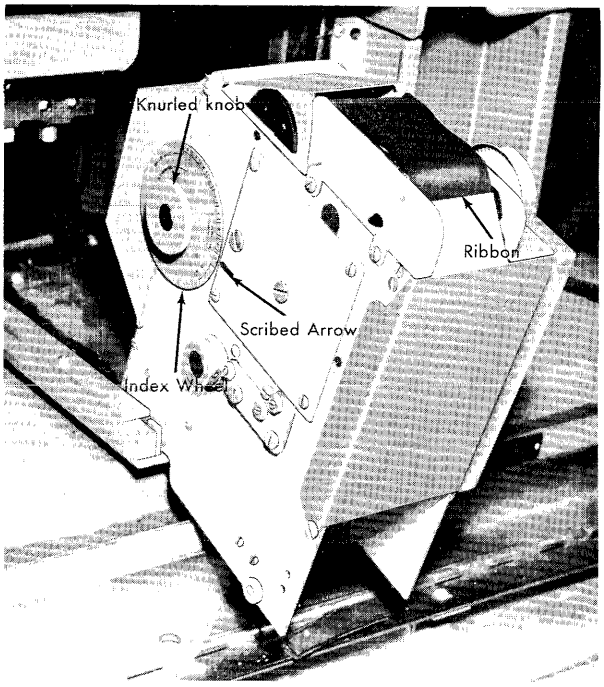


Figure 25. Left Side of Print Unit

If the print unit cannot be engaged readily, these steps should be taken:

1. Draw the unit toward the front of the machine.
2. Turn the knurled knob on the left side of the unit until the letter D on the index wheel is in line with the arrow scribed on the unit (Figure 25).
3. Hold the wheel in this position and slide the unit toward the rear of the machine, stopping at the notch desired.

If the unit is engaged in one of the printing notches, and if the control-panel entry hubs are wired to a source of information, all cards are printed. If desired, printing can be controlled to print only X-cards or only NX-cards.

A zero wired to the right of a significant digit is always printed, even if blank positions intervene; a zero to the left of the first significant digit is not printed. Blank columns and positions not wired are not printed.

In Figure 26, X-detail cards in the punch unit are to be end printed during a gangpunching operation. The same X is used for both print control and gangpunch control, but two different X's could be used if desired.

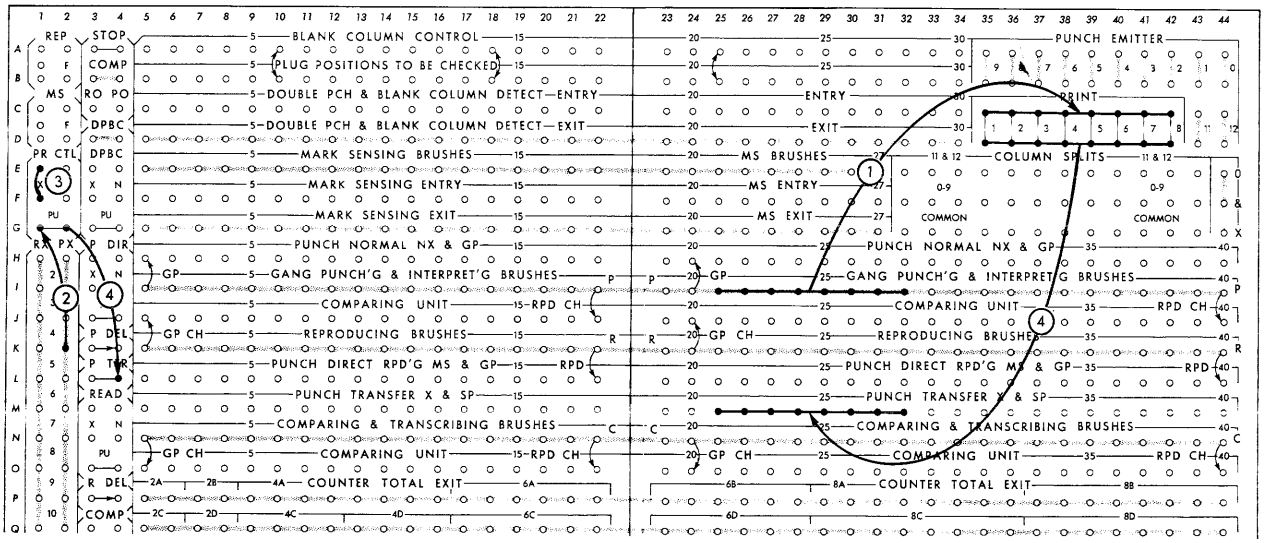
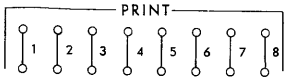
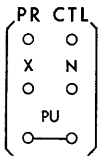


Figure 26. End Printing and Interspersed Master-Card Gangpunching



C-D, 35-42

Print. These eight pairs of hubs are entries to the eight print wheels: the *1* hubs are the entry to the left (high-order) print wheel; the *2* hubs to the wheel that is second from the left, etc.; and the *8* hubs to the right (units position) print wheel. If all cards are to be printed, the N hubs alone of the print control unit must be wired.



E-G, 1-2

Pr Ctl (Print Control). When the PRINT hubs are wired, all cards are printed if the N hubs alone are wired. This feature also permits the printing of only one type of card, X or NX.

The PU (Pickup) hubs are wired from an X-brush that is set to read the identifying X in the card. Then, if the X hubs are jackplugged, only X-cards are printed; if the N hubs are jackplugged, only NX-cards are printed. If the pickup hubs are wired and neither the X nor N hubs are jackplugged, no cards are printed. This control has a built-in delay unit to compensate for the difference in time when the PU is impulsed from an X-brush and the card is printed at the print unit. (See Figure 3)

WIRING (FIGURE 26)

1. PRINT hubs are wired from the GANGPUNCHING AND INTERPRETING BRUSHES, because it is desired to print information punched in the card itself. (To print information from a card in the read unit, the PRINT hubs would be wired from the COMPARING AND TRANSCRIBING BRUSHES.)
2. The PX brush that reads the identifying X is wired to PRINT CONTROL PICKUP. Then, depending on the wiring of the X or N hubs, printing takes place or is suspended when the source card reaches the printing station.
3. The PRINT CONTROL X hubs are wired to cause the printing of all X-cards. If the NX-cards were to be printed, the jackplug would be removed from the PRINT CONTROL X hubs and placed in the N hubs.
4. Because the information being printed is also being punched and punching is controlled for interspersed master cards, PUNCH TRANSFER must be used for entry to the punch magnets. The PX brush is wired to P TFR from the common hubs of PR CTL PU. If the punch direct method were used for gangpunch control, back circuits through the punch magnets might cause erroneous punching or printing.

Combined Reproducing, Gangpunching, and End Printing

The IBM 519 Document-Originating Machine is ideally suited to the preparation of card documents. In a typical application, an attendance card is prepared for each employee by reproducing and gangpunching from master cards, and end printing the employee number at the same time. Each employee records the times he arrives at and leaves work on the attendance card, using an attendance recorder. At the end of the week, the total time is determined and marked on the card. These marks are then translated into punched holes by another run through the 519, using the special mark-sensing feature. Subsequently, the card is used in other IBM machines to calculate and prepare the payroll.

Figure 27 shows a typical attendance card form. A master deck contains the name, tax class, employee number, regular rate, and overtime rate for each employee. This deck is fed through the read unit and reproduced into the attendance cards which are fed through the punch unit. The date for the pay period is punched into a single master card that is fed ahead of the attendance cards. The date is gangpunched from this card into all the attendance cards. A blank card is fed ahead of the master deck in the read unit.

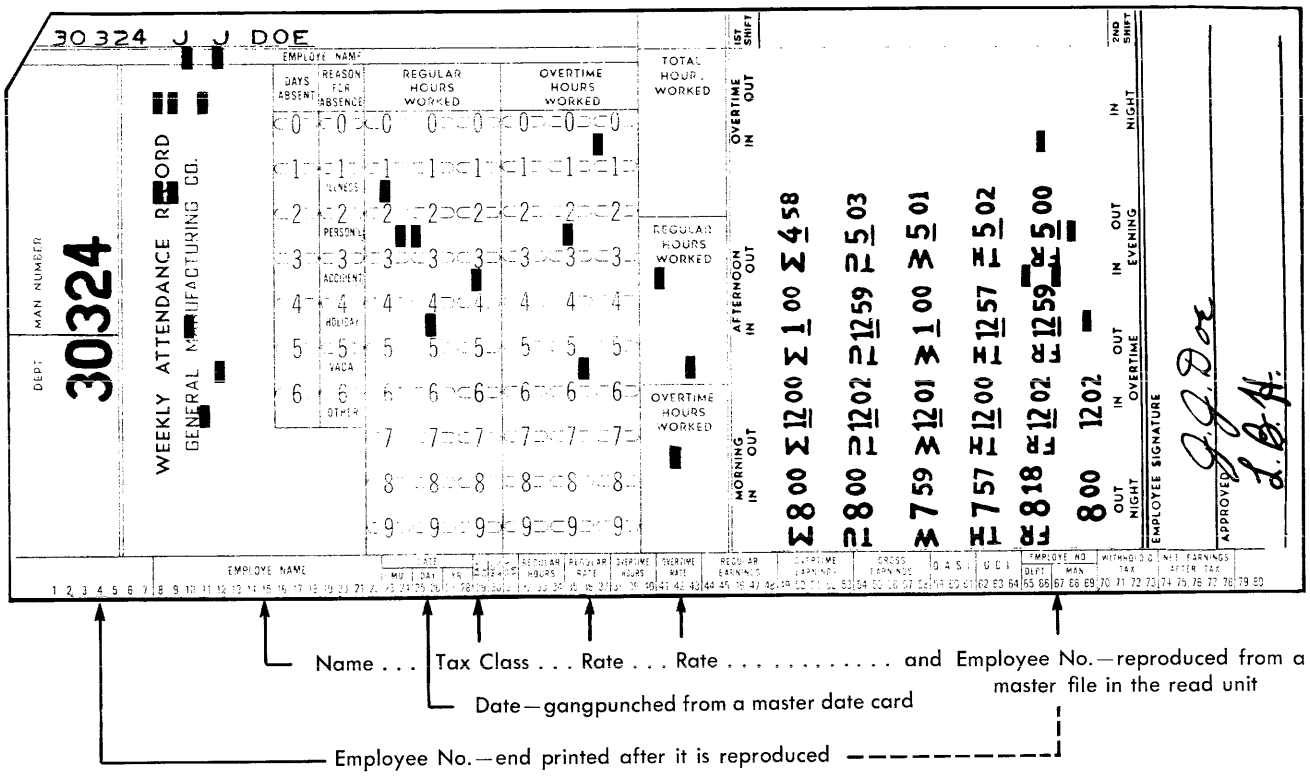


Figure 27. A Typical Attendance Record Card

After the cards have been punched, they are compared and the employee number in each card is interpreted by the end-printing unit. (The card shown in Figure 27 has also been interpreted with employee number and name using an IBM 548 Interpreter.)

WIRING (FIGURE 28)

1. Because the two units are to be used together for reproducing, REP is wired ON.
2. The REPRODUCING BRUSHES are wired to the PUNCH DIRECT entries to reproduce name, tax class, regular rate, overtime rate, and employee number.
3. The information that is reproduced is also compared through this wiring.
4. The date is gangpunched through the reproduced deck from a single master card.
5. The employee number is interpreted on the end of the card.

NOTE: The field cannot be wired to both print and compare if comparing is ever suspended by the comparing-control feature.

Offset Gangpunching and End Printing

The punch-transfer method should be used for offset-gangpunch wiring. However, the gangpunching and interpreting brushes are split- or double-wired to PUNCH and PRINT (or DPBC DETECT ENTRY). The split wiring nullifies the suspension circuit to cause unwanted punching in the master card. This punching must be eliminated by a selector.

A general rule can be stated: A selector is required when P DIR PU is impulsed and a given set of brushes is split-wired to PUNCH and another feature like end printing or double-punch and blank-column detection.

WIRING (FIGURE 29)

1, 2, 3. Normal wiring for offset gangpunching from the master card to the first detail card. PX is wired to P DIR PU to suspend punching when master cards pass the punching station.

4. Normal wiring for end printing.

5. Wiring from PRINT hubs to PUNCH NORMAL hubs would nullify the effect of PX and cause unwanted punching in the master card.

5A. Unwanted punching in the master card is eliminated by wiring PRINT to PUNCH NORMAL hubs through the normal side of the selector. The selector is picked up from the master-card X.

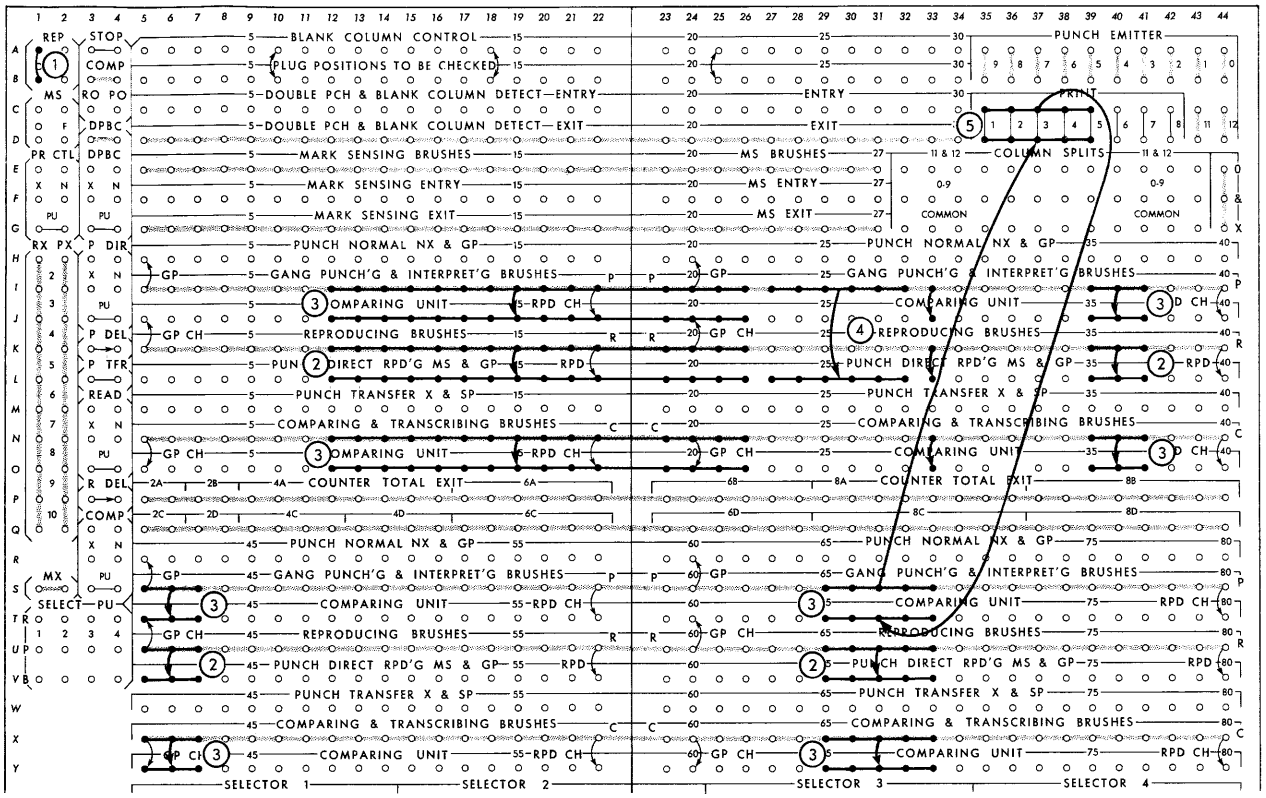


Figure 28. Reproducing, Gangpunching, and End Printing

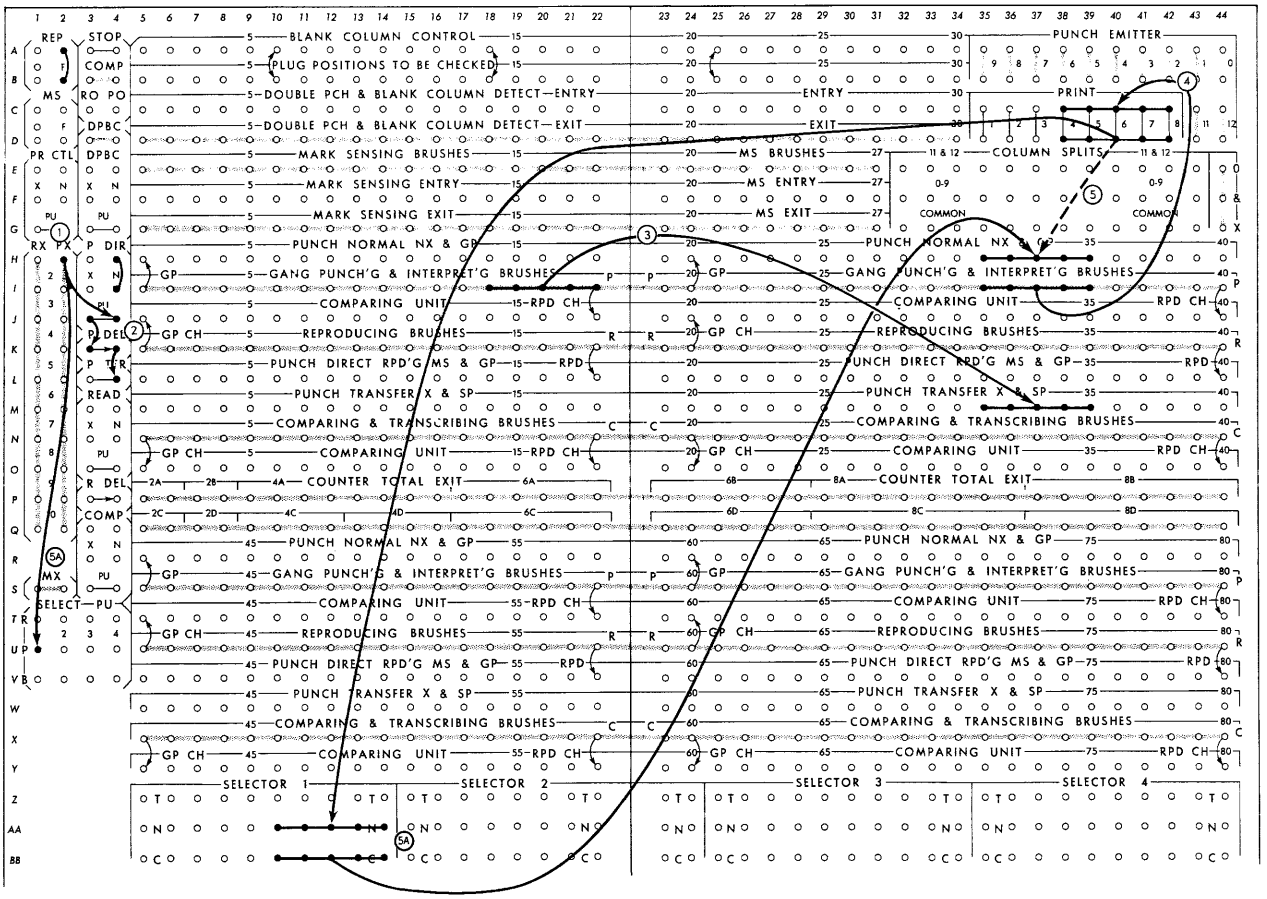


Figure 29. Offset Gangpunching with End Printing

Summary Punching

Summary punching is the automatic preparation of one total or summary card to replace a group of detail cards. A summary card contains the identification of the group and one or more totals accumulated for that group.

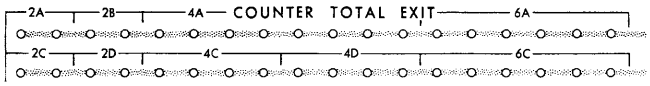
For summary punching operations, the IBM 519 is connected to an accounting machine through a connecting cable. Both machines must be turned off before the two machines are connected. The 519 can be connected to the IBM 402, 403, 407, 408, 419 Accounting Machine.

Before any summary-punching operation can be started, cards must be fed into the 519. The START key on the 519 is pressed to feed cards in the punch unit. The machine takes two cycles, feeding the first card to the gangpunching brushes. This makes it possible to feed a gangpunch master card ahead of the cards in the punch unit.

The accounting machine operates as usual until a control change occurs for which summary cards are to be punched. Then it stops, and does not print or reset until the summary card has been punched. The 519 starts and feeds a card past the punch station. Simultaneously, it reads the amounts standing in the counters in the accounting machine and punches these in the proper columns. When the summary punching operation has been completed, the accounting machine prints the totals, resets the counters, and then starts accumulating the next control group.

The PUNCH TRANSFER hubs on the 519 control panel are made receptive automatically, and are the only entries that can be used for summary punching.

The summary-punch cable should be disconnected from the accounting machine if either machine is to be used independently.



P-Q, 5-44

Counter Total Exit. When the 519 is connected for summary punching to any accounting machine except the 407 or the 408, these hubs are connected to the corresponding counter positions in the accounting machine. When the accounting machine signals the 519 to punch a summary card, these hubs emit the totals accumulated in the counters.

When the 519 is connected to the 407 or 408, these hubs are connected to the 80 SUMMARY PUNCH ENTRY positions in the 407. These entry positions represent the 80 card columns and are, in turn, wired on the 407-408 control panel from counters, storage units, or an emitter. Any selection that may be required is wired on the 407-408 control panel; the only wiring required on the 519 control panel is from the 80 counter total exits to the 80 punch entries.

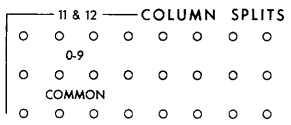
For punching, the COUNTER TOTAL EXITS must be wired to the PUNCH TRANSFER entry hubs.

Summary Punching with a Net-Balance Accounting Machine

When positive and negative totals accumulated in a net-balance accounting machine are summary punched, they must be distinguished by an identifying punch. An X is usually punched for this purpose, and is available on the accounting machine control panel from special SUMMARY PUNCH X CONTROL exit hubs. One set of hubs emits the X on minus totals, and another set on plus totals, so that either credit or debit cards can be X-punched.

On a 402, 403, or 419 control panel the X is wired to a SUMMARY PUNCH CONTROL ENTRY hub. The X is then available on the 519 control panel at the correspondingly numbered COLUMN SPLIT.

In Figure 30, counter 8A in the IBM 402, 403, or 419 Accounting Machine is cleared on a minor program. The minor total is to be summary punched, and an X is to be punched over the units position of each credit total.



E-G, 32-39

Column Splits. The first 8 COLUMN SPLITS are connected through the summary-punch cable, to the entries for summary-punch control on the accounting machine control panel. An X wired to one of these entries is available at the 11-12 hub of the corresponding COLUMN SPLIT on the 519 panel. The X may be wired to punch from the 11-12 hub or the C hub of the COLUMN SPLIT.

When the 519 is used with the 407 or 408, all control wiring is done on the accounting-machine control panel. The only wiring required on the 519 is the connecting of the 80 COUNTER TOTAL EXITS to the 80 PUNCH TRANSFER position.

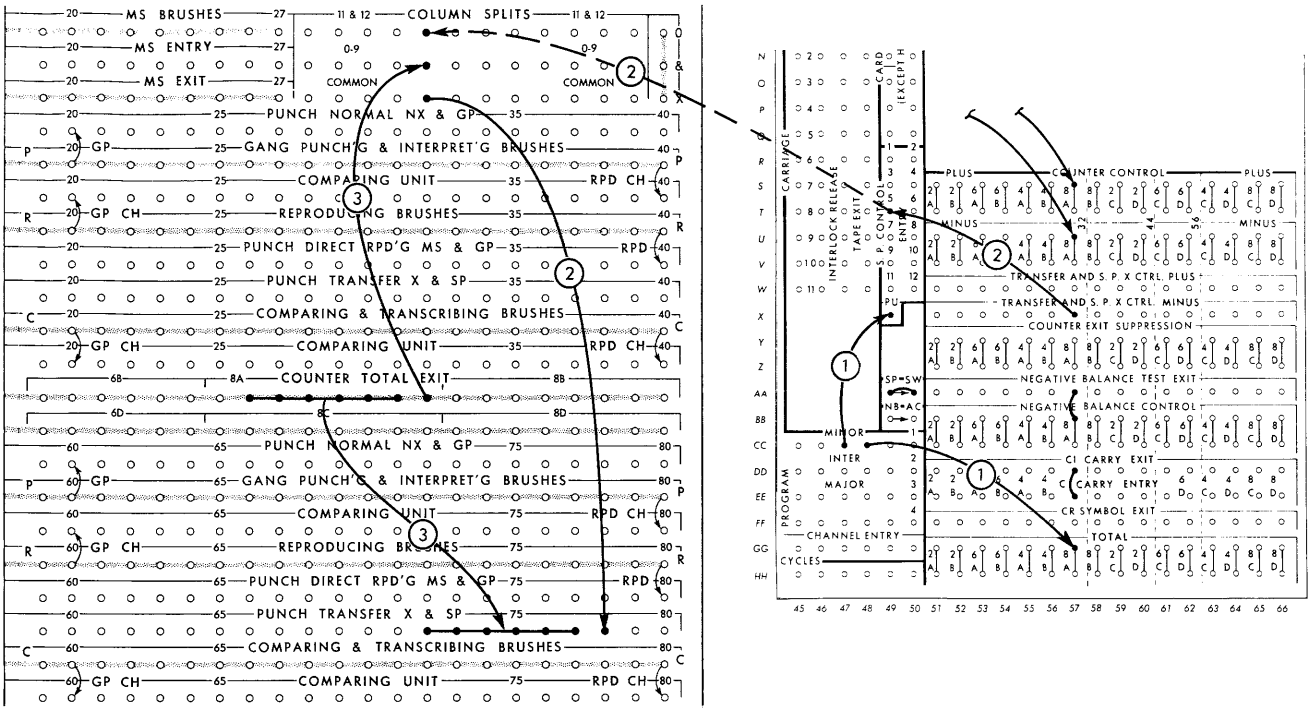


Figure 30. Summary Punching — Net-Balance Accounting Machine

WIRING (FIGURE 30)

1. Counter 8A is wired for a minor total. The MINOR PROGRAM is also wired to the SUMMARY PUNCH PU hub. This causes the 519 to punch a summary card on each minor control change.

2. If the counter is negative, an 11 impulse is emitted from the SUMMARY PUNCH X CONTROL MINUS hub. This impulse is wired to the SUMMARY PUNCH CONTROL ENTRY hub where it passes through the cable and is available at the correspondingly numbered COLUMN SPLIT on the 519 control panel. Because the COMMON hub of the COLUMN SPLIT is connected to the 11-12 hub at this time, the impulse passes through and is punched as an X in column 78.

3. Impulses representing the amount in counter 8A are emitted from the COUNTER TOTAL EXIT hubs and wired to PUNCH TRANSFER. The low-order counter position is wired through the 0-9 side of the COLUMN SPLIT to punch under the X in column 78.

SUMMARY PUNCHING WITH A NON-NET-BALANCE ACCOUNTING MACHINE.

For this operation, two counters are required in the accounting machine. A normal counter adds all the positive cards and subtracts all the negative cards, in the same manner that a net-balance machine is controlled. A second counter is wired in reverse, so that it subtracts the positive cards and adds the negative cards. At total time, a test is made of the high-order position of the normal counter. If this counter stands at zero, a positive total exists and is summary punched and printed from the normal counter. If the high-order position of the normal counter stands at 9, a negative total exists. Because the second counter has been controlled in the opposite manner, if a negative result exists in the normal counter the amount in the second counter is summary punched, printed, and identified as a credit balance. Selectors are therefore required on both the 519 and the accounting machine, to punch and print from the proper counter.

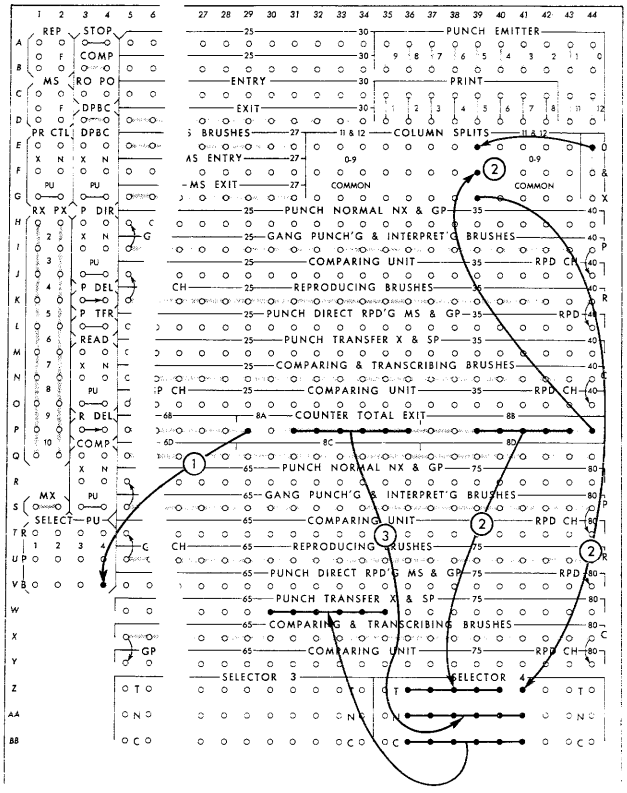


Figure 31. Summary Punching — Non-Net-Balance Accounting Machine

In Figure 31, counter 8A in IBM 402, 403, or 419 Accounting Machine is used for the normal counter, and counter 8B is used for the second counter.

WIRING (FIGURE 31)

1. If the high-order position of counter 8A contains a 9, a test impulse emitted from the high-order COUNTER TOTAL EXIT is wired to transfer the selector using the BALANCE pickup.
2. Because the presence of the test impulse indicates that counter 8A is negative, counter 8B is summary punched through the transferred side of the selector. To indicate that this amount is negative, an X emitted from the 0&x hubs is punched over the units position.
3. If counter 8A is positive, no impulse is emitted from the high-order position and the selector remains normal. Counter 8A is then punched through the normal side of the selector, and the absence of an X-punch indicates that this amount is positive.

Combined Reproducing, Gangpunching, and Summary Punching

Reproducing, gangpunching (one master card only), and summary punching can be performed simultaneously. The gangpunch master card is placed in front of the cards in the punch hopper, and a blank card is placed in front of the cards in the read hopper. One depression of the START key feeds cards in both the read and punch units, so cards are in proper position for the combined operation.

Data are reproduced and summary punched simultaneously as cards pass through the machine. Each time the accounting machine punches a summary card, the read unit operates and reproducing is performed from the reproducing brushes. For example, employee name can be reproduced, from a master deck in the read unit, into the summary card that is being punched with earnings amount from the accounting machine. The employee number is also summary punched for indication. On the following cycle, the employee number that was summary punched is compared against the employee number in the reproduced source card to prove that the reproduced and summary-punched data have been properly associated. If for any reason name and earnings are not correctly associated, the comparing unit stops the machine.

WIRING (FIGURE 32)

1. Because both units are operated together, REP is wired ON.
2. The PUNCH TRANSFER hubs are made receptive automatically on summary-punching cycles. Employee number is summary punched from the accounting machine for indication.
3. Employee earnings are summary punched from the accounting machine through this wiring.
4. Employee name is reproduced from the master name file in the read unit.
5. Date is gangpunched.
6. The employee number, summary punched from the accounting machine, is compared with the employee number in the source card in the read unit.
7. The name punched in the new card is compared with the name punched in the source card.

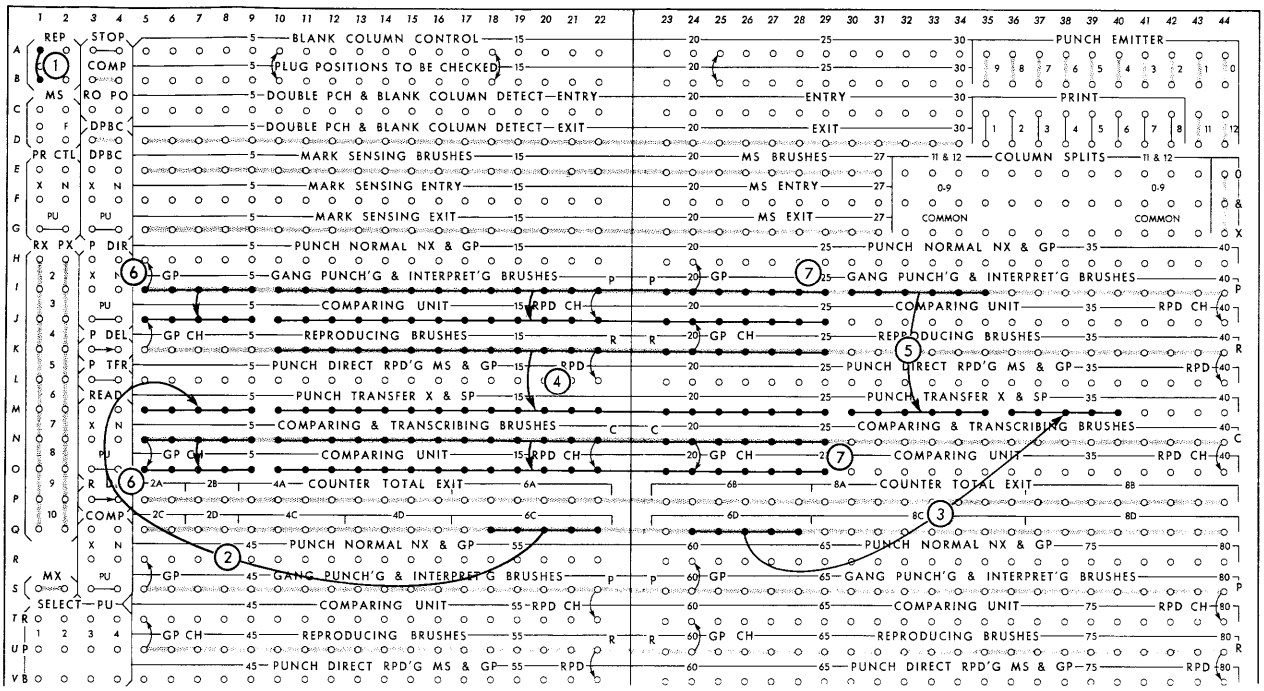


Figure 32. Reproducing, Gangpunching, and Summary Punching

Reset and Restoring Procedures

These procedures depend upon the kind of error that occurs and the installation of special devices like the punch and read offset-stacking devices. They are intended to help the operator recognize and correct these errors.

Comparing Error Without PO & RO

If the machine does *not* have both the punch and read offset-stacking special devices installed and a comparing error occurs:

1. the machine stops and the comparing (COMP) light comes on.
2. a comparing indicator shows the column in which the error occurred.
3. remove cards from the read and punch hoppers
4. lift the restore lever to restore the comparing unit.
5. press the START key to run cards out of the machine.
6. three cards run out of the read unit and four cards run out of the punch unit. Check the third card from the top in both stackers.
7. correct the errors and resume operation.

Comparing Error with PO and RO

If the machine has *both offset-stacking* special devices installed and wired, the machine does not stop for a comparing error. The error cards are offset in the stackers and the comparing indicator unit is automatically restored.

If the STOP hubs are wired on the control panel, the machine stops and the error cards are offset. To resume operation the RESET key and START key must be pressed in that order.

Double Punch and Blank Column Error

If the machine stops as a result of a double-punch or blank-column error:

1. The DP & BC DETECT light comes on.
2. Remove cards from the hoppers.
3. Press the RESET key and the START key.
4. Check all cards that are run out for double-punch or blank-column errors.
5. Correct the error cards and resume operation.

Offset Devices

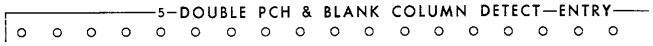
RO (Read Offset), PO (Punch Offset). If the machine is equipped with a read offset-stacking device and the RO hub is impulsed, the card at the comparing brushes is offset 3/8 inch forward when it reaches the read stacker. If the machine is equipped with a punch offset stacking device and the PO hub is impulsed, the card at the gangpunching brushes is offset 3/8 inch forward when it reaches the punch stacker.

If a machine is equipped with both RO and PO stacking devices, the machine does not stop for a comparing error unless STOP is jackplugged. No restoring lever is provided on such machines because the comparing unit restores automatically if the device is wired. If both RO and PO are installed and the STOP hubs are jackplugged, the RESET key must be pressed to restore the comparing machine.

Double-Punch and Blank-Column Detection

This device is used to detect unpunched card columns and columns containing multiple punches. It can be wired to detect either or both conditions. The device is supplied on all machines equipped with mark sensing. It is available as a special feature on machines without mark sensing.

This device can be used during gangpunching, reproducing, or summary-punching operations; or it can be used for separate checking operations. However, DP & BC DETECT and punching cannot be wired from the same columns at the same time if punching is ever suspended by the punch-direct feature. Similarly, DP & BC DETECT and COMPARING cannot be wired from the same columns at the same time if comparing is ever suspended by the comparing control feature. DP & BC is available in complements of 10, 20 or 30 positions.



C, 5-34

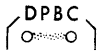
DP & BC *Entry*. Multiple punching in a card column can be detected by wiring the column to be checked from the GANGPUNCHING BRUSHES to a DP & BC ENTRY position. If the column is not punched, it is detected if the corresponding BLANK COLUMN CONTROL position is wired.

D, 5-34

DP & BC *Exit*. When DP & BC detection is used in conjunction with gangpunching, the GANGPUNCHING BRUSHES are wired to DP & BC ENTRY and from DP & BC EXIT to punch. To detect blank columns without checking for double punching, these hubs must be used as *entries* to the DP & BC unit; if the columns are also to be gangpunched, split wiring is necessary.

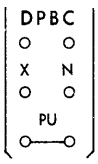
A-B, 5-34

Blank Column Control. These hubs are jackplugged to the hubs directly below them to cause the corresponding position of the DP & BC unit to check blank columns.



D, 3-4

DP & BC. These exit hubs emit an impulse when either a double-punched column or a blank column is detected. They are wired to stop the machine or, if an offset-stacking device is installed, to offset the card.



E-G, 3-4

DP & BC. This switch can be wired to control the DP & BC unit so that only one type of card (X or NX) is checked for double punches and blank columns.

The PU (Pickup) hubs are wired from an X-brush. Then if the X-hubs are jackplugged, only X-cards are checked; if the N-hubs are jackplugged, only NX-cards are checked. If the pickup hubs are wired and neither the X- nor N-hubs are jackplugged, NX-cards are checked.

WIRING (FIGURE 33)

1. Field A is wired for double-punch and blank-column detection.
2. Field B is wired for double-punch detection only.
3. Field C is wired for blank-column detection only.
4. The unit is controlled so that only X-cards are checked. NX-cards would be checked if the jackplug were removed from the X hubs. All cards are checked if the control section is not wired. DPBC is wired to stop the machine if an error occurs.
5. All three fields are gangpunched in an X-detail operation. In an X-master operation, the PUNCH NORMAL entries would be used.

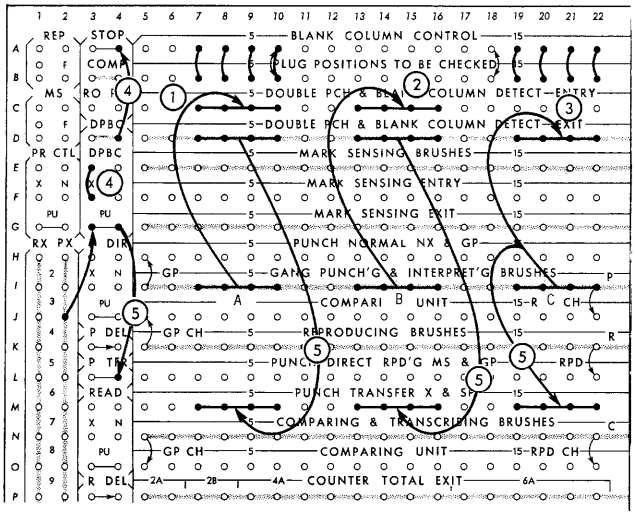


Figure 33. Double-Punch and Blank-Column Detection

Mark Sensing

Mark sensing is based on the principle that a pencil mark can conduct electricity. This necessitates a special lead with a high graphite content. The mark-sensing device reads pencil marks on the cards and punches the corresponding holes in any desired columns. It can be installed in either or both the punch and read units. It is available in complements of 10, 20 or 27 positions.

Mark-sensing columns are arranged on the cards as shown in Figure 34. Each mark-sensing column covers three punching columns. Up to 27 columns of

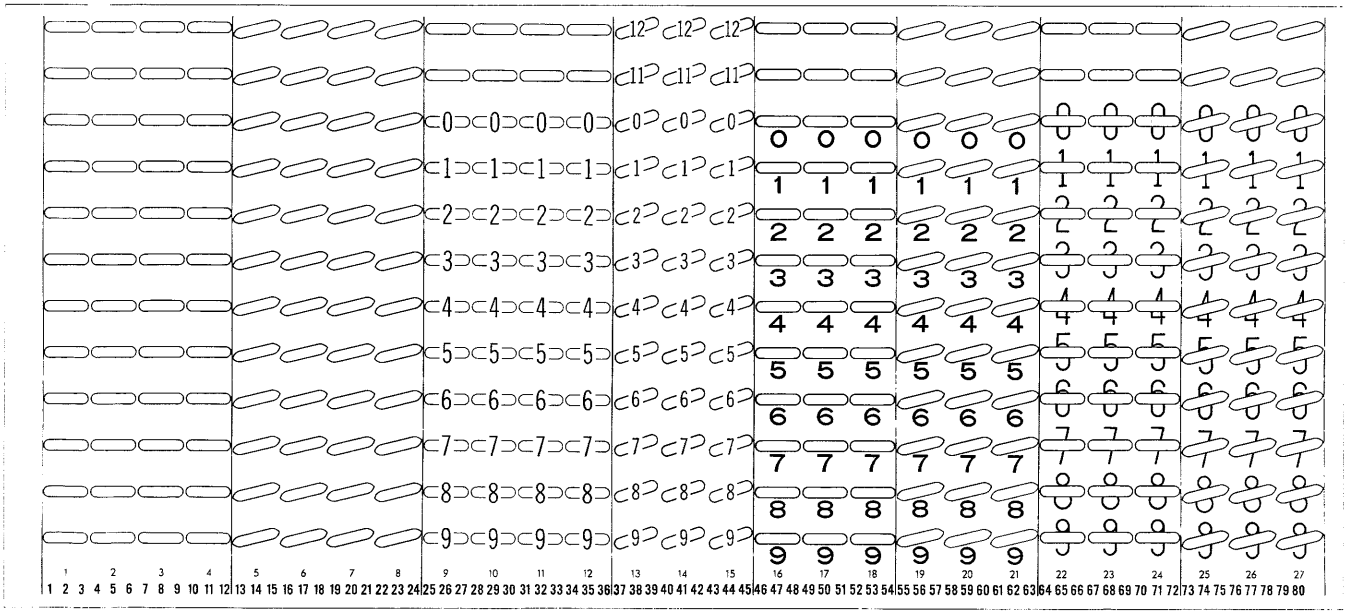


Figure 34. Column Arrangement and Eight Styles of Mark Sensing

data can be marked on one side of the card. Any of these positions can be sensed by the mark-sensing brushes in the punch unit. If the cards are to be fed in the read unit, only the first 26 columns can be sensed; column 27 is not available in the read unit.

If mark sensing in both units is employed in a single run, a maximum of 27 mark-sensed columns can be punched. Any MARK SENSING ENTRY or EXIT position may be used in conjunction with either the punch unit or the read unit, but not with both simultaneously.

Mark-sense punching is checked by the double-punch and blank-column detection device, which is installed whenever the machine is equipped with the mark-sensing device. If an error is detected, card feeding can be stopped or the error card can be offset in the punch stacker. An offset-stacking device is installed in the punch stacker whenever the machine is equipped with the mark-sensing device in the punch unit.

E, 5-31

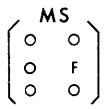
Mark-sensing Brushes. Each of the 27 columns of mark sensing is read by a brush. Each mark-sensing brush consists of three separate brushes. The two outer brushes of the group are connected, and the center brush is wired to the brush exit on the control panel. A mark on the card conducts a small amount of electricity from the outer brushes to the center brush. A mark-sensing brush is always wired to a MARK SENSING ENTRY position.

Mark-sensing brushes are installed in the punch unit between the PX brushes and the punch station (Figure 3); in the read unit, they are installed between the RX brushes and the reproducing brushes.

F-G, 5-31

Mark-sensing Entry, Exit. Because the pencil marks do not conduct enough electricity to operate the punches, the electrical impulse must be amplified. Each MARK SENSING ENTRY hub is the entry to an amplifier. The MARK SENSING BRUSHES must be wired to these entries. When a brush senses a pencil mark, the small amount of electricity is amplified and emitted from the corresponding MARK SENSING EXIT hub as an impulse suitable to cause punching.

When the 519 is equipped with electronic mark-sensing, a MARK SENSING EXIT hub must never be wired to two or more punch entries; similarly, a MARK SENSING EXIT and a punch brush, or emitter, must not be split-wired to a punch-entry position. A selector must be used.



C-D, 1-2

MS (Mark-Sensing Switch). This switch must be wired ON to place the mark-sensing unit in operation. When the unit is wired ON, there is a delay between the time the main-line switch is turned on and the START key becomes operative. This time delay allows the electronic amplifiers to warm up before they are placed in use.

When the 519 is equipped with electronic mark sensing, this switch must be wired OFF, or not wired, for any operation involving the use of the hand crank (e.g., to feed a card or to remove a card jam).

WIRING (FIGURE 35)

1. MARK SENSING BRUSHES 6-13, that read the mark-sensing fields, are wired to the MARK SENSING ENTRIES for amplification. MS is wired ON.
2. From the MARK SENSING EXITS, these columns are wired to punch in the proper columns.
3. As a check on the accuracy of the mark-sense punching, the punched holes are read as the card passes the gangpunching brushes, and this reading is wired to the DOUBLE-PUNCH BLANK-COLUMN DETECTION ENTRIES. The corresponding BLANK-COLUMN CONTROL positions are wired.
4. DPBC is wired to offset any error cards.

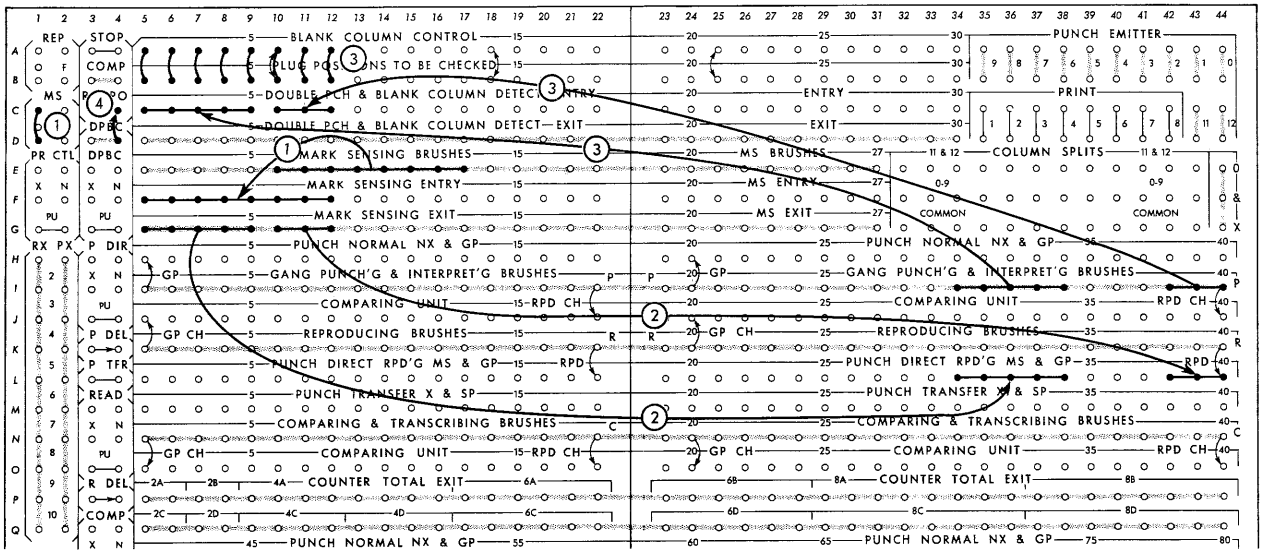
GANGPUNCHING WITH MARKED MASTER CARDS

It is possible to use marked master cards for gangpunching. The master cards must have a distinguishing 12-mark or be prepunched with an X. When a marked master card passes the mark-sensing brushes, the marks are sensed and amplified to cause punching into the master card. Subsequently the card passes the gangpunching brushes and is gangpunched back into

the detail cards that follow. The process is repeated each time a new marked master arrives at the mark-sensing brushes.

S, 1-2

MX (Mark Sense X). These hubs emit an X-impulse when a marked 12 is wired to the *first* MARK SENSING ENTRY position. This X-impulse can be used in the same manner as an X-brush reading. In addition, when a marked 12 is wired to the first MARK SENSING ENTRY position, the MARK SENSING EXIT emits an 11 impulse (X) for punching.



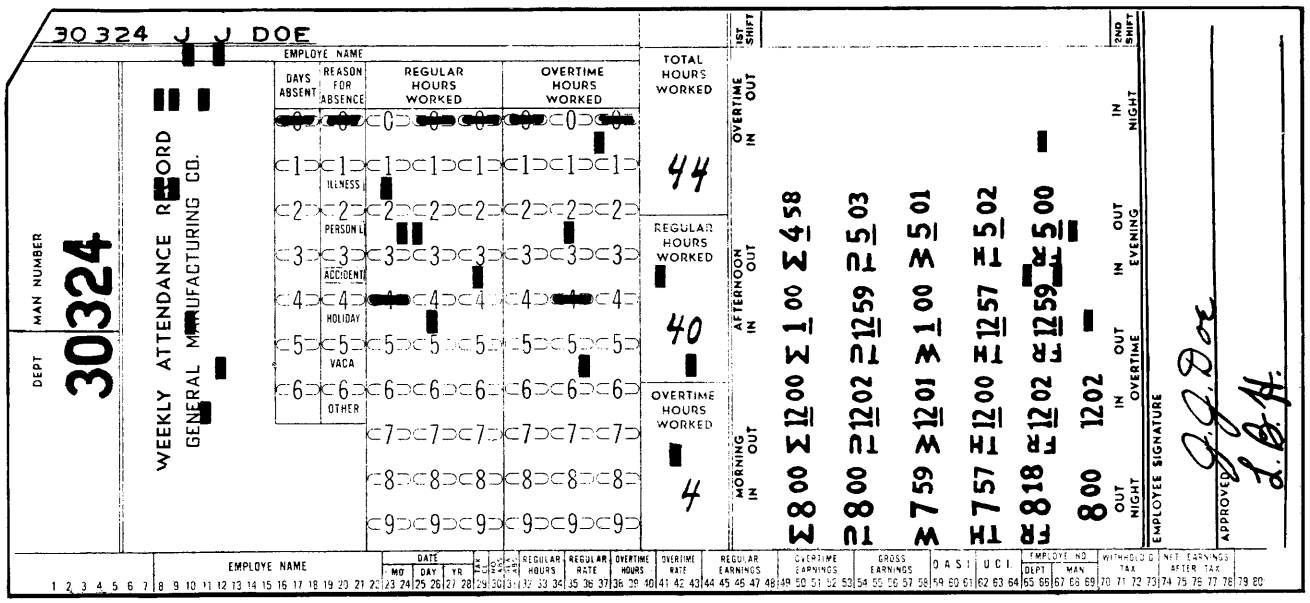


Figure 35. Mark Sensing

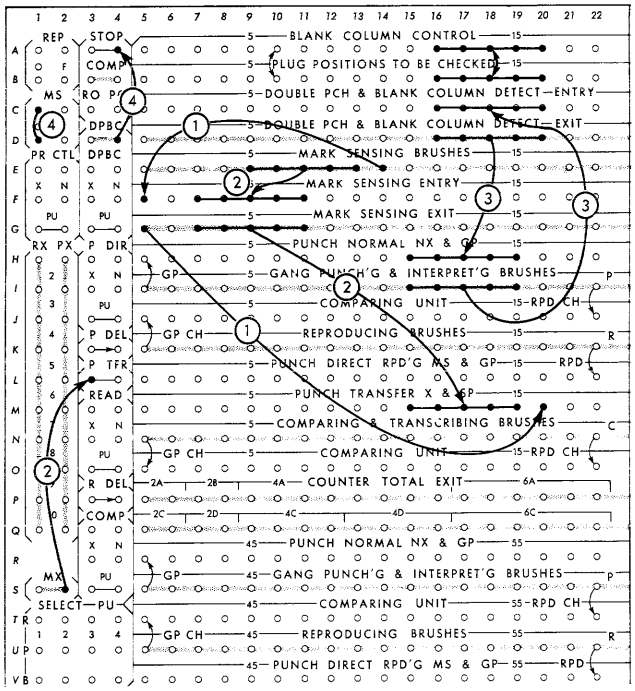


Figure 36. Gangpunching with Marked Master Cards

Wiring (Figure 36)

1. Marked masters are distinguished by a 12-mark in mark-sense column 10. MS brush 10 is wired to the PUNCH TRANSFER entry through the first ENTRY-EXIT position of the amplifier unit to punch an X in column 16. The 12-mark also causes the MX hubs to emit an X-impulse.
2. The MX-impulse is wired to operate punch transfer. As the marked master card passes the punch station, the marks are read and punched into it, through the PUNCH TRANSFER entries.
3. Normal gangpunching occurs from the gangpunching brushes wired to PUNCH NORMAL. This wiring is taken through the double-punch and blank-column detection unit to check both the mark sensing and the gangpunching.
4. Mark sensing is wired ON, and the DPBC is wired to stop card feeding if an error is detected.

Mark-Sense Punching and Checking

In a normal mark-sensing operation, columns are usually checked for blanks and/or double punches by use of the DP & BC device. This method stops the machine for either condition but does not differentiate between double punching and blank columns, nor does it indicate the position in which the double punch or blank column occurred.

Another method using modified wiring not only stops the machine but also indicates the type of error in the following manner:

Blank Column: DP & BC light turns on.

Double-Punched Column: COMP light turns on. In addition, the position in which double punching occurred is pointed out by the column indicator.

If a blank column and a double-punched column occur on the same card, the DP & BC light, the comparing light, and the column indicator turn on simultaneously.

Wiring (Figure 37)

1. Mark-sense reading and punching: MS BRUSHES 8-12 to MS ENTRY 2-6. MS EXIT 2-6 to PUNCH NORMAL 2-6. Mark-sensing switch ON.
2. Blank-Column Detection: GANGPUNCH BRUSHES 2-6 to DP & BC DETECT EXIT 2-6. BLANK COLUMN CONTROL switches 2-6 wired ON. DP & BC exit to STOP.
3. Double-Punch Detection: GANGPUNCH BRUSHES 2-6 direct to upper COMPARING UNIT 2-6. GANGPUNCH BRUSHES 2-6 through DP & BC EXIT and DP & BC ENTRY to lower COMPARING UNIT 2-6. Double-punch errors are detected because the gangpunch brushes emit both impulses directly to the upper comparing positions while DP & BC ENTRY emits only the first impulse read to the lower comparing positions. With this wiring, the column indicator points out which column is double-punched.

NOTE: The above method cannot be used if mark-sense punching and checking is under X-control.

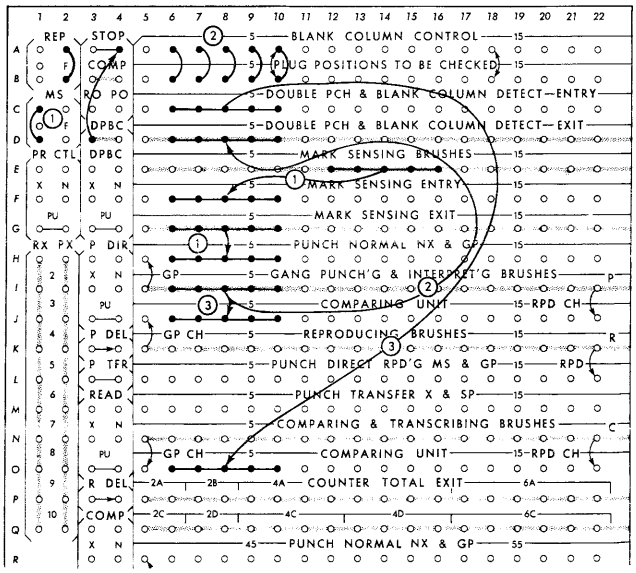
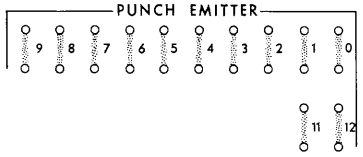


Figure 37. Mark-Sense Punching and Checking

Punch Emitter

The emitter furnishes a convenient source of impulses for punching or printing constant information not contained in cards. On each cycle, the hubs of the emitter supply the corresponding impulse, that can be wired to cause punching or printing.



A-B, 35-44; C-D, 43-44

The emitter does not operate until a card reaches the gangpunching brushes. When the emitter is being used without a master card, a blank card must be fed ahead of the detail cards to be punched.

WIRING FOR EMITTER PRINTING AND EMITTER PUNCHING (FIGURE 38)

1. Data common to all cards are printed from the EMITTER.
2. Common data can be punched as well as printed. The EMITTER is wired to punch, and the punching is interpreted.
3. Printing as well as punching can be controlled for X- or NX-cards.

Right-Hand End Printing

The right-hand end-printing device permits end printing on the right-hand (column 80) end of the card (Figure 39), instead of the left-hand end.

The specifications for right-hand end printing are:

1. Not interchangeable; the IBM 519 cannot be equipped to print on both left- and right-hand ends.
2. The distances of the printing from the 9-edge and the 12-edge of the card are not the same as for standard left-hand end printing.
3. For right-hand end printing, cards are fed face down, 9-edge first, rather than standard 12-edge first.
4. Because of the reversal of cards in the feed, X-control is not possible while end printing. Also mark sensing and end printing cannot be used simultaneously. It should be noted that reverse control-panel wiring is necessary; i.e., PRINT position 8 becomes PRINT position 1.
5. Zeros, to print, must be both punched in the card and wired.
6. When the 519 is not being used for end printing, cards can be fed normally, and all regular machine operations can be performed.

Inverted End Printing

Inverted end printing (Figure 40) fills a need for the preparation of merchandise tags and for applications involving the use of preprinted stub cards.

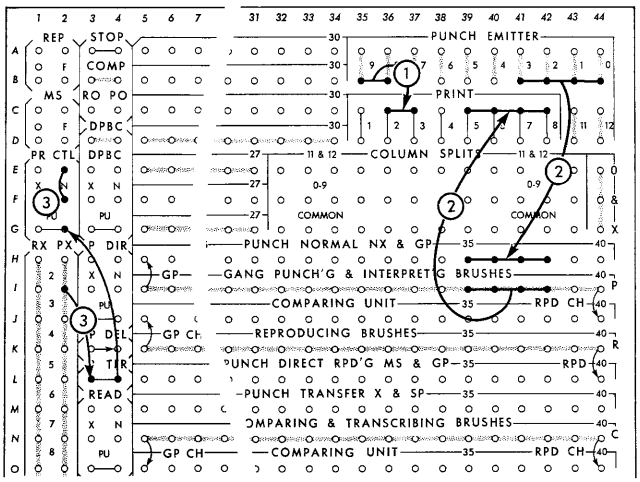


Figure 38. Emitting

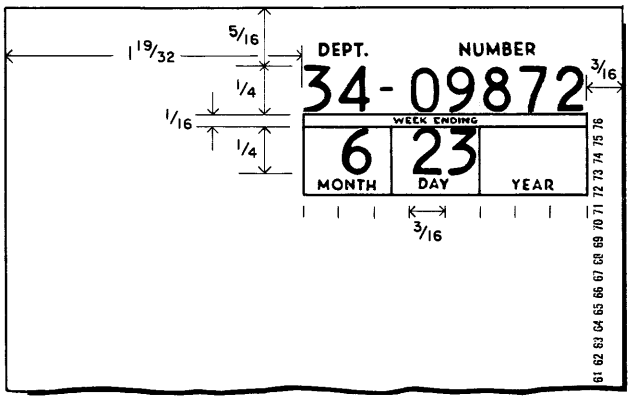


Figure 39. Right-Hand End Printing

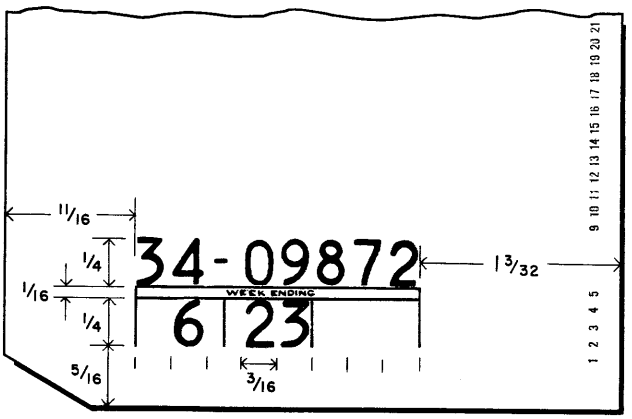


Figure 40. Inverted End Printing

The specifications for inverted end printing are:

1. Not interchangeable; printwheels are permanently installed upside down.
2. The standard two lines of eight numerical characters are printed in exactly the same area of the card as for regular left-hand end printing, the only difference being that the numerals are in an inverted position.
3. Cards are fed in the normal manner, and all machine operations are standard.
4. Because of the reversal of the print line, print wiring must be reversed; i.e., on the control panel, PRINT position 8 becomes PRINT position 1.
5. Zeros, to print must be punched in the card and wired.

Count-Controlled Punching and Serial-Number Printing Device

The count-controlled punching and serial-number printing device is designed primarily to prepare serially-numbered unit control cards for use in tub file applications. Descriptive information from a master setup card is gangpunched into a required quantity of blank cards, and, at the same time, serial numbers are printed on the cards in either descending or ascending sequence, as specified. In either case, the required quantity and the starting number for each group has been punched in a number control card. The device has two four-position counters, one to accept the quantity required and control the quantity of cards to be prepared for each group, and the other to accept the starting number and control the serial-number printing. The offset-stacking device in the punch feed is included with this device.

Descending Sequence

The starting serial number to be punched in the number control card is determined by adding the quantity required to the serial number printed on the last unit control card for the item in the tub file. For example, if the serial number on the last card for the item in the tub file is 4500 and 500 cards are required, 5000 is punched in the starting number field, and 0500 is punched in the quantity required field. The highest starting serial number that can be punched in the number control card is 9,999 and at least two tub file cards must be punched for each group.

Ascending Sequence

The starting serial number for each group can be any number from 0001 to 9998. The highest required quantity that can be punched in the number control card for any one group is the difference between the starting number and 9,999. For example, if the starting number is 0100, the highest required quantity is 9899. At least two tub file cards must be punched for each group.

Operation

For each group, a master setup card containing the descriptive information, followed by a number control card containing both the starting serial number and the required quantity is placed in the read hopper. Two blank cards must follow the deck in the read hopper. Blank cards are placed in the punch hopper. As the operation starts, the master setup card reproduces into the first blank card to produce the first tub file card. The number control card feeds immediately behind the master setup card to enter the starting serial number and the quantity required into the counting mechanism. The read feed then stops, but the punch feed continues to operate, gangpunching description and printing serial numbers until the required quantity of cards has been gangpunched. The first card of each group in the punch stacker is offset. After the last card of one group has been prepared, the counting mechanism tells the machine to feed the next master setup card in the read feed, and the process is then repeated for the next group. Since the operation requires the use of both feeds, the reproduce switch must be wired ON.

Control-Panel Hubs

SN (serial number switch). This switch must be wired ON for the operation of the device. For normal operation of the IBM 519 Document-Originating Machine, this switch can be wired OFF or it need not be wired at all.

Serial. The four serial hubs are wired from the REPRODUCING BRUSHES to enter the starting serial number from the number control card. These hubs accept impulses only from a number control card as it passes the reproducing brushes.

Quantity. The four quantity hubs are wired from the REPRODUCING BRUSHES to enter the required quantity from the number control card. These hubs accept impulses only from a number control card as it passes the reproducing brushes.

Print. The four print hubs can be wired to print in any of the eight printing positions. When print hubs 5 to 8 are wired to print the serial number, print hubs 1 to 4 can be used to print other information, directly from the GANGPUNCH AND INTERPRETING BRUSHES. If printing is not required, these hubs are not wired, and the device gangpunches the quantity required for each group without printing the serial number.

In normal use, cards are placed in both hoppers face down, 12-edge toward the throat. Serial numbers print on the face of the card at the left-hand (column 1) end.

If serial number printing is desired on the back of the card, the blank cards are placed in the punch hopper face up, 12-edge toward the throat. The numbering on the reverse side is on the 80-column end. When cards are fed face up through the punch feed, PUNCH TRANSFER hub 1 on the control panel corresponds to column 80 of the blank card, PUNCH TRANSFER hub 2 to column 79, 3 to 78, etc., so that all wiring from REPRODUCING BRUSHES to PUNCH TRANSFER must be reversed.

Figure 1 illustrates the wiring for normal use of this device.

WIRING (FIGURE 41)

1. The SN switch is wired ON.
2. Stock code and description (columns 1 to 15) are reproduced from the master setup card into the first card of each group. PUNCH TRANSFER is automatically receptive when a master setup card passes the REPRODUCING BRUSHES; therefore, no X-control punching is required in the master card.
3. Stock code and description are gangpunched for the remaining cards of each group. Stock code is also printed from print wheels 1-4.
4. Starting serial number, punched in columns 31-34 of the number control card, is entered into the device.
5. Quantity required, punched in columns 35-38 of the number control card, is entered into the device.
6. Serial numbers are printed from print wheels 5-8.
7. The reproduce switch is wired ON.

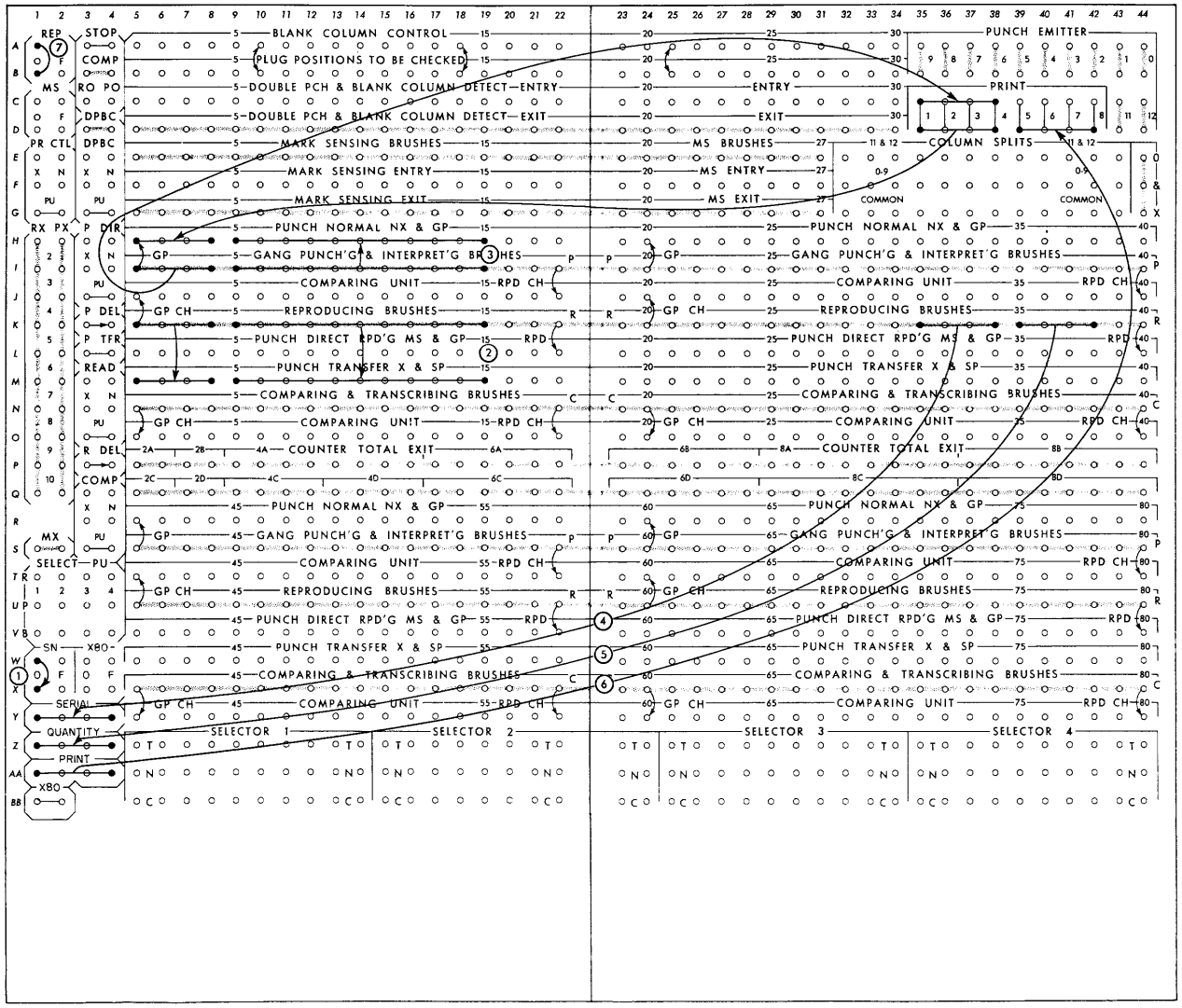


Figure 41. Serial-Number Printing and Count-Controlled Punching

X-80 Switch

When this switch is wired ON or not wired, punch magnets 41-80 are normally inactive. They can be made active by wiring the X-80 switch OFF. Therefore, this switch must be wired OFF for normal reproducing and gangpunching in columns 41-80. This switch has no effect on punch magnets 1-40.

Tumble Card Operation (X-80 Pickup)

In many tub file applications, items that require not more than 40 columns of information are punched in double-use tumble cards, while items that require more than 40 columns are punched in single-use cards. In either case, tub file cards are pulled and used as master setup cards. By use of the X-80 pickup, one control panel can be wired to gangpunch from single-use cards from which more than 40 columns are to be gangpunched and from tumble cards from which only 40 columns are to be gangpunched during the same run. In this operation, single-use cards are X-punched. Because the X must be read by an RX brush, the X can be punched in any column of the card. The RX is wired to the X-80 PICKUP, and the X-80 switch can be wired ON or not wired at all. When the X-80 pickup is impulsed from a single-use card, punch magnets 41-80 become active for the entire group. When this feature is used, blank cards must be placed in the punch hopper. When this feature is not used, tumble cards punched in the first use but not in the second can be placed in the hopper.

Each section of the control panel in Figure 42 is assigned a number, under which the hubs are briefly described.

1. *REP (Reproduce Switch).* This switch must be wired on (O) for operations in which the punch and read units are used together, as in reproducing. For all other operations, this switch may be disregarded or wired OFF (F).

2. *MS (Mark-Sensing Switch).* The mark-sensing feature of the machine is operative when this switch is wired ON (O). For operations not involving mark sensing, this switch may be disregarded or wired OFF (F). When the unit is wired ON, there is a delay between the time the main-line switch is turned on and the time the START key becomes operative. This time delay allows the electronic amplifiers to warm up before they are placed in use. When the machine is equipped with electronic mark sensing, this switch must *not* be wired ON when the hand crank is used.

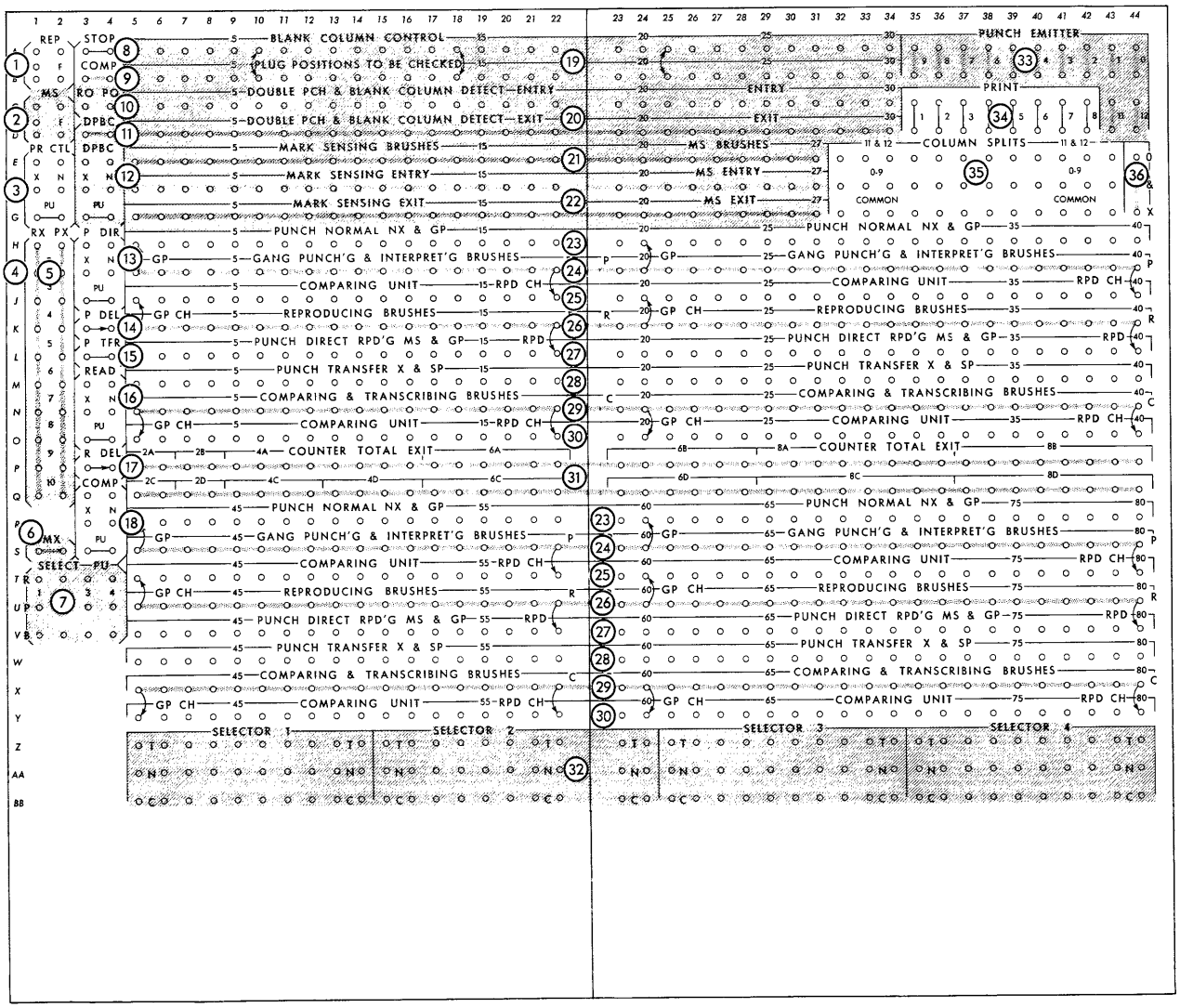


Figure 42. Control-Panel Summary

3. *PR CTL (Print Control).* When an X-brush reading is wired to the PU hubs, only X-cards are printed if the X hubs are jackplugged; only NX-cards are printed if the pickup is wired and the N hubs are jackplugged. No cards are printed if the print unit is engaged and wired, and the pickup alone is wired.

4. *RX (Read X-Brushes).* Six RX-brushes are standard. Each hub in the vertical column labelled RX is the control-panel exit for an RX brush. After the RX-brush is placed in the desired column, it can be connected to any RX exit on the control panel by wiring the brush to the corresponding entry on the X-panel in the read unit near the RX-brushes.

5. *PX (Punch X-Brushes).* Six PX-brushes are standard. Each hub in the vertical column labelled PX is the control-panel exit for a PX-brush. After the PX-brush is placed in the desired column, it can be connected to any PX exit on the control panel by wiring the brush to the corresponding entry on the small panel in the punch unit near the PX brushes.

6. *MX (Mark Sense X).* These hubs emit an impulse similar to an X-brush impulse when a marked 12 is wired to the *first* MARK-SENSING ENTRY position.

7. *SELECT PU (Selector Pickup).* For proper operation of the selectors, the pickup hub corresponding to the source of the pickup impulse should be used. The row of pickup hubs marked R should be impulsed from the RX brushes; that marked P, from the PX brushes. The row of pickup hubs marked B is receptive to a balance-pickup impulse obtained from the extreme left position of a COUNTER TOTAL EXIT in a summary-punch operation. This impulse is available when the corresponding counter stands with a negative balance and is used to transfer selectors for alternate counter punching during non-net-balance operations.

8. *STOP.* When these hubs are impulsed, the machine stops. These hubs also emit an impulse when a comparing error is detected. On a machine equipped with both RO and PO stacking devices, these hubs are not common; the left hub is then an exit and the right hub is an entry. The left hub then emits an impulse when a comparing error occurs. This can be wired to the right hub to stop card feeding, or to an offset hub to offset the error card in the stacker.

9. *COMP. (Comparing Exit).* These hubs are no longer active. The function that they formerly performed is now wired internally.

10. *RO (Read Offset).* When RO is impulsed, the card passing the comparing brushes is offset 3/8" forward in the read stacker if the machine is equipped with a read offset stacker.

PO (Punch Offset). When this hub is impulsed, the card under the gangpunching brushes is offset 3/8" forward in the punch stacker if the machine is equipped with a punch offset stacker.

11. *DPBC (Double-Punch and Blank-Column Exit).* This exit emits an impulse when a double-punched or blank column is detected. If the machine is equipped with this device, the impulse can be used either to stop card feeding or to offset the error card in the stacker.

12. *DPBC (Double-Punch Blank-Column Switch).* This switch is effective if the machine is equipped with the double-punch and blank-column detection device. When an X-brush reading is brought to the pickup hub, only X-cards are checked for double punches and blank columns if the X-hubs are jackplugged; only NX-cards are checked if the pickup alone is wired, or if the pickup is wired and the N-hubs are jackplugged. All cards are checked if the entries are wired and this section is not wired.

13. *P DIR (Punch Direct Switch).* This switch can be wired to control all punch-entry hubs, permitting punching for only one type of card, X or NX. When an X-brush reading is wired to the pickup hub, only X-cards are punched if the X-hubs are jackplugged; only NX-cards are punched if the pickup alone is wired, or if the pickup is wired and the N-hubs are jackplugged. Punching is operative on every cycle if this section is not wired. When this feature is used to suspend punching, the brushes that are wired to the punch entries must not be wired to any other feature of the machine.

14. *P DEL (Punch Delay).* If an X-brush reading is wired to the entry (left hub), it is available at the exit (right hub) one cycle later. The delayed impulse is available just before the X-card originating the impulse passes the gangpunching brushes.

15. *P TFR (Punch Transfer Pickup).* When this pickup hub is impulsed, readings brought to the PUNCH TRANSFER entries (item 28) cause punching. At all other times, the PUNCH NORMAL hubs are entries to the punch magnets, unless P DIR is controlled.

16. *READ.* This switch can be wired to control card feeding in the read unit. If a punch X-brush is wired to the pickup and the X-hubs are jackplugged, a card is fed past the reproducing brushes whenever an X-card is fed past the punch station. If only the pickup is wired, or the pickup is wired and the N-hubs are jack-

plugged, a card is fed past the reproducing brushes whenever an NX-card is fed past the punch station. This switch does not affect feeding in the punch unit. If it is not wired, the read unit operates continuously for reproducing operations.

17. *R DEL (Read Delay).* When an X-brush reading is wired to the entry (left hub), it is available from the exit (right hub) one cycle later, just before the X-card passes the comparing brushes.

18. *COMP (Comparing Switch).* When the pickup is impulsed with an X-brush reading, comparing is effective only for X-cards if the X-hubs are jackplugged; it is effective only for NX-cards if the pickup alone is wired, or if the pickup is wired and the N-hubs are jackplugged. All cards are compared if the entries (items 25 and 30) are wired and this section is not wired. When this feature is used to suspend comparing, the brushes that are wired to the comparing entries must not be wired to any other feature of the machine.

19. *BLANK-COLUMN CONTROL.* These hubs operate in conjunction with the DOUBLE-PUNCH and BLANK-COLUMN ENTRIES and EXITS. If a column is to be checked for the absence of a punch, the corresponding BLANK-COLUMN CONTROL hub must be wired from the hub beneath it. If these hubs are not wired, only double punching is detected.

20. *DP and BC Detection Entry, Exit.* Columns to be checked for double punching or no punching must be wired through these hubs. Any available positions can be used. When a field is being checked during gangpunching, it is wired from the GANGPUNCHING BRUSHES to the DP and BC ENTRIES and from the DP and BC EXITS to the punch entries. If a field is to be checked for blank columns only, the GANGPUNCHING BRUSHES are wired to the DP and BC EXITS, which become *entries.*

21. *MARK SENSING BRUSHES.* The 27 mark-sensing brushes are brought to these hubs on the control panel.

22. *MARK SENSING ENTRY, EXIT.* Each pair of ENTRY and EXIT hubs represents a mark-sensing amplifier. MARK SENSING BRUSHES must be wired to the ENTRIES and from the corresponding EXITS for mark-sense punching. If the brush wired to an ENTRY hub reads a mark, the EXIT hub emits an impulse suitable to cause punching. The MARK SENSING EXIT hubs are wired to the punch entries.

A 12 mark wired to the first MARK SENSING ENTRY hub causes the MX hubs (item 6) to emit an impulse similar to an X-brush impulse; also an X-(11) impulse is available from the first EXIT hub for punching.

23. *PUNCH NORMAL NX & GP.* These 80 hubs are normally entries for punching the corresponding columns of the card. They are inactive if punching is suspended by P DIR (item 13), or if the P TFR PICKUP (item 15) is impulsed.

24. *GANGPUNCHING AND INTERPRETING BRUSHES.* These 80 hubs are exits from the corresponding columns of the card passing the gangpunching brushes.

25. *COMPARING UNIT.* These hubs are entries to one side of the comparing unit. The entries to the other side of the unit (item 30) are placed near the COMPARING BRUSHES. Whenever an impulse enters one side of the comparing unit, it should be matched by a similar impulse to the other side, in the corresponding entry positions. If the impulses do not coincide, the unit stops card feeding, turns on the light in the comparing unit and the COMP light on the signal panel, and causes the STOP hubs (item 8) to emit an impulse. The indicators in the comparing indicator unit show which positions failed to agree. Comparing is under the control of the COMPARING switch (item 18).

26. *REPRODUCING BRUSHES.* These 80 hubs are the exits for the corresponding columns of the card passing the reproducing brushes.

27. *PUNCH DIRECT RPD'G MS & GP.* These 80 hubs are directly connected to the punch magnets. When impulsed, they cause punching unless punching is suspended by P DIR (item 13).

28. *PUNCH TRANSFER X & SP.* These 80 entries to the punch magnets are effective on cycles when P TFR (item 15) is impulsed, provided punching is not suspended by P DIR (item13). The PUNCH NORMAL entries are disconnected when the PUNCH TRANSFER entries are made effective, or vice versa.

29. *COMPARING AND TRANSCRIBING BRUSHES.* These 80 hubs are exits for the corresponding columns of the card passing the comparing brushes.

30. *COMPARING UNIT.* These hubs are entries to one side of the comparing unit (see item 25).

31. *COUNTER TOTAL EXIT.* For summary-punching operations, the totals in the counters of the accounting machine are available at these hubs.

32. *SELECTORS.* The hubs of the common (C) row are connected to the corresponding hubs of the normal (N) row at all times except when the selector pickup (item 7) is impulsed. When the pickup is impulsed, the hubs of the common row are connected to the corresponding hubs of the transferred (T) row.

33. *PUNCH EMITTER.* These hubs emit impulses to permit punching of common information, such as date. They can also be used to end print without punching. The emitter does not operate until a card reaches the gangpunching brushes.

34. *PRINT.* These hubs are entries to the eight print wheels used for end printing. Hub 1 prints in the high-order position; hub 8, in the units position.

35. *COLUMN SPLITS.* The 11-12 hub in each column is connected to the COMMON hub when the 11 or 12 position of the card is being read or punched. The 0-9 hub is connected to the COMMON hub while zero through nine are being read or punched. This allows digits or zone punches to be eliminated or transferred to other card columns. In a summary-punch operation the first 8 COLUMN SPLITS are connected, through the summary-punch cable, to the entries for summary-punch control on the accounting-machine control panel. An X wired on the accounting machine is available at the 11-12 and COMMON hubs of the COLUMN SPLIT on the 519 panel.

36. *0 & X.* These hubs emit zero- and X-impulses on all punching cycles. By using these impulses in conjunction with the COLUMN SPLITS, zero- or X-impulses can be separated and used to fill fields or add control punches.

Notes—IBM 519 Timing Chart (Figure 43)

1. To be wired to lower hub only.
2. Not active.
3. Active only on summary punch cycles.
4. The circuitry has an automatic built-in delay of one cycle.
5. MX emits only during mark-sense operations when a 12-mark is read by an MS brush connected to the first MARK SENSE ENTRY position.
6. Operative only if the print unit is in place and the print light is lit.
7. Emits one cycle after left hub is impulsed.
8. Impulsed from the extreme left position of a COUNTER TOTAL EXIT in summary punching. It is used during non-net-balance operations.
9. Selectors are transferred by an X-type impulse at 13.0-13.5 time. They are transferred immediately for the entire cycle.
10. The stop hubs function in three different ways:
    a. During normal operations, they are common entry hubs.
    b. If the machine registers a comparing error and *both* offset-stacking devices are not installed, they are common exit hubs.
    c. If the machine registers a comparing error and *both* offset-stacking devices are installed, the left hub is an exit hub and emits an impulse. The right hub is an entry hub and can receive the impulse to stop the machine.

EXITS

ENTRIES

IBM 519 TIMING CHART

HUBS	LOCATION	NOTES
Blank-Column Control (Upper Hub)	(A, 5-34)	1
Column Splits	0-9 (F, 32-43) 11 and 12 (E, 32-43)	
Comparing and Transcribing Brushes	(N, X, 5-44)	
Comparing Exit	(B, 3-4)	2
Comparing Switch (Upper)	X (Q, 3) N (Q, 4)	1 2
Comparing Switch Pickup	(S, 3-4)	
Comparing Unit	(J, O, T, Y, 5-44)	
Counter Total Exit	(P, Q, 5-44)	3
Double-Punch and Blank-Column Detection Entry	(C, 5-30)	
Double-Punch and Blank-Column Detection Exit	(D, 5-34)	
Double-Punch and Blank-Column Exit	(D, 3-4)	
Double Punch and Blank Column Pickup	(G, 3-4)	4
Double Punch and Blank Column Switch (Upper)	X (E-3) N (N-4)	1 2
Gangpunching and Interpreting Brushes	(I, S, 5-44)	
Mark Sense	X (S, 1-2)	5
Mark Sensing Brushes	(E, 5-31)	
Mark Sensing Entry	(F, 5-31)	
Mark Sensing Exit	(G, 5-31)	
Mark Sensing Switch (Upper)	Off (C, 2) On (C, 1)	1 2
O & X	(E, F, G, 44)	
Print	(D, E, 35-42)	
Print Control (Upper)	X (E, 1) N (E, 2)	1 6
Print Control Pickup	(G, 1-2)	4
Punch Delay (Left) In	K-3	
Punch Delay (Right) Out	K-4	7
Punch Direct, Reproducing, Mark Sense and Gangpunching	(L, V, 5-44)	
Punch Direct Pickup	(I, 3-4)	
Punch Direct Switch (Upper)	X (H, 3) N (H, 4)	1 2
Punch Emitter	(A-B, 35-44) (C-D, 43-44)	
Punch Normal NX and Gangpunch	(H, 5-44)	
Punch Offset	(C, 4)	
Punch Transfer	(L, 3-4)	
Punch Transfer X and Summary Punch	(M, W, 5-44)	
Punch X-Brushes	(H-Q, 2)	
Read Delay (Left) In	P-3	
Read Delay (Right) Out	P-4	7
Read Offset	(C, 3)	
Read Switch (Upper)	X (M, 3) N (M, H)	1 2
Read Switch Pickup	(O, 3-4)	
Read X-Brushes	(H-Q, 1)	
Reproduce Switch (Upper)	Off (A, 2) On (A, 1)	2 1
Reproducing Brushes	(K, U, 5-44)	
Selector Pickups R (T, 1-4) P (U, 1-4) B (V, 1-4)		8
Selectors	T (Z, 5-44)	9
Stop	(A, 3-4)	10

Wiring Diagrams 206200X 224065E

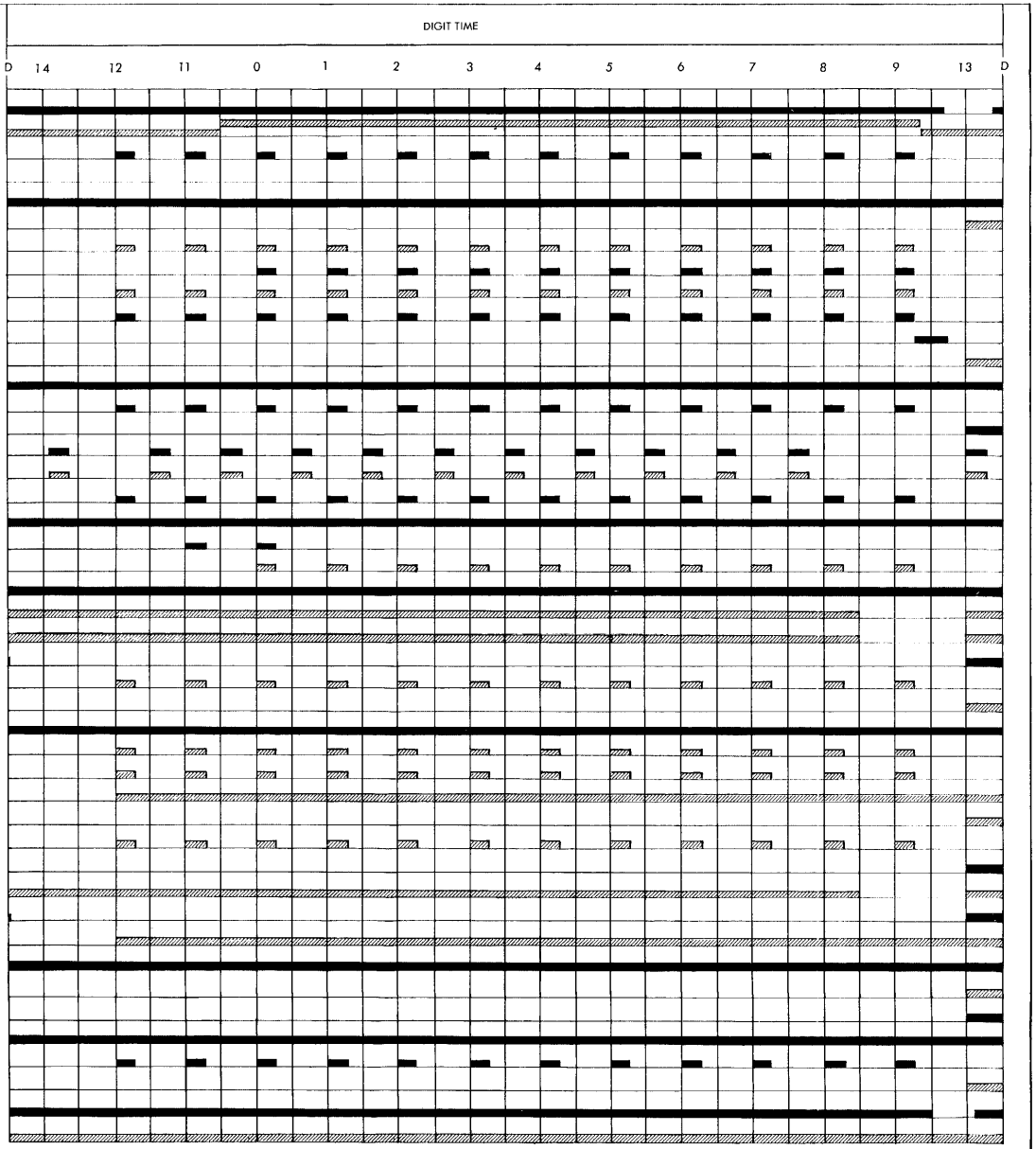


Figure 48. Timing Chart

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(10-59:10M-W)

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